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Fig. 1.—Exterior Service-Box Installation.

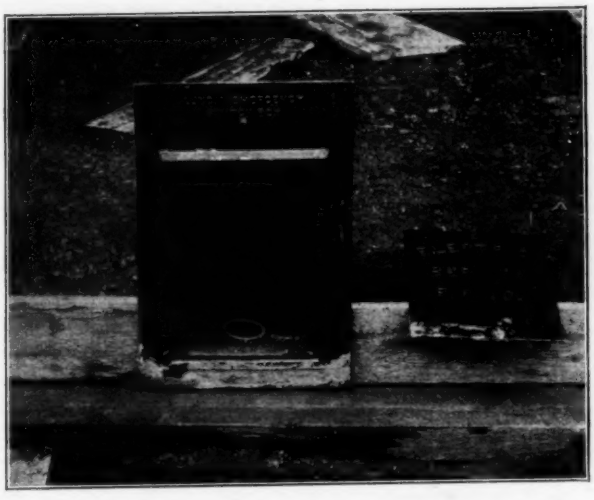

Fig. 2.—Service Box Set Up Prior to Building Erection.

Providing Underground Service Connections Economically

Several Types of Service Connections from Underground Distributing Systems That Reduce the Investment Necessary and Give Reliable Results in Practice

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IN PROVIDING an underground distribution system for the supply of lighting and power service, many more factors enter the problem than in the case of overhead distribution.

It is necessary and important that a careful study of the field be made and a system of distribution laid out which will permit of expansion for future needs.

The matter of devising some form of underground construction where the investment, particularly in residential districts, would not be out of proportion to the revenue obtained, has been a problem on which central-station companies have been working for some time past.

UNDERGROUND FEEDERS WITH INTERIOR-BLOCK OVERHEAD DISTRIBUTION.

In suburban sections where there is considerable agitation against overhead wires along the streets, a measure of relief may be obtained by the use, in connection with the underground system, of backyard or alley distribution, sometimes called interior-block construction, such as is illustrated in Fig. 3. Installations of this type are generally popular with the public and have, in many places, met with less antagonism than other forms of construction.

A plan adopted by many companies is to obtain permission from property owners for setting poles on the rear lot lines. A transformer may be installed in the manholes along the main conduit, as shown in the illustration, or the primary cable may be run to the transformer mounted on one of the distribution poles, thus supplying the entire block through an overhead secondary main.

This system of distribution does not, however, do away entirely with poles on all the streets, as it is frequently found necessary to erect poles along the highway to take care of the street-lighting circuits. While from a maintenance standpoint the backyard distribution lines may be somewhat undesirable because of the necessity of trespassing on private property, this objection is not very serious and is usually overcome by having the property owners deed to the lighting company the ground in which the poles are erected, together with the right of free access at all times.

Few difficulties are encountered in securing the right of access as the property owner usually appre-

ciates the effort of the company to keep the streets free from poles and the shade trees from being marred owing to the presence of overhead wires in the streets. A system of distribution such as that just described will in most cases be found satisfactory and economical, particularly in sections where the business would not warrant the investment of a complete underground installation.

In cities where the load is concentrated and where improved forms of pavement are in use, underground systems of the drawing-in type using vitrified tile, fiber, or concrete ducts, have now become practically standard construction. The method of distribution, however, varies considerably. The arrangement of service connections and conduit systems is dependent

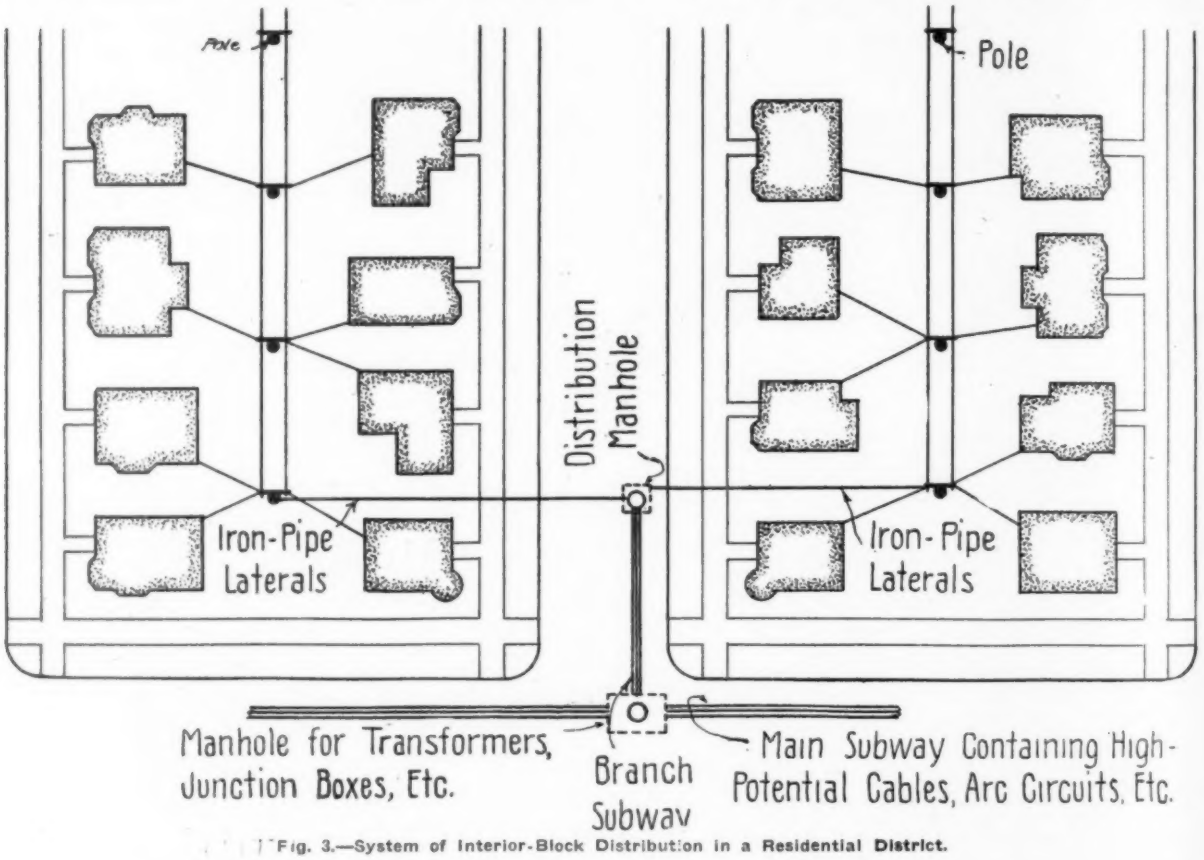


Fig. 3.—System of Interior-Block Distribution in a Residential District.

to a large extent upon local conditions and the character of the service to be furnished.

Underground Service Laterals.

That part of the underground system of distribution known as the service lateral from the main duct line to the consumer's premises is important and represents a large percentage of the underground investment.

Service connections are usually installed in wrought iron, steel or fiber pipe. Where the metallic service pipe is provided it is usually coated with asphaltic compound to prevent corrosion, or in some cases galvanized or sherardized pipe is used to prolong the life.

In Fig. 4 is shown an arrangement of service manholes and lateral connections for a single-conduit system. It will be noted from this illustration that it is necessary to dig up the street for the installation of each individual service.

In Fig. 5 is shown a layout of service laterals for a single-conduit system with crossings. In this system the individual service runs for feeding the side of the street opposite the main conduit line are somewhat shorter than required in the installation illustrated in Fig. 4. It has, however, the disadvantage of requiring twice as many service manholes. On this account such an installation is recommended only on streets which are exceptionally wide and where the load is heavy. This condition necessarily requires large-size cables, junction boxes and other subsurface equipment, the installation of which must be made in service manholes.

Another plan of installing service handholes and laterals is by means of a double-conduit system illustrated in Fig. 6. Under this arrangement, a main-line conduit consisting of the requisite number of ducts for all service cable is installed on one side of the street and a distribution conduit consisting of from two to four ducts is installed on the opposite side of the street for taking care of the consumers' secondary mains and service wires, as well as local street-lighting cables. In such an installation the two conduits are usually connected by crossings at every intersecting street. In an installation of this type, a complete secondary network can be provided and by means of disconnecting manhole subway boxes, trouble on the system can be readily isolated.

While the foregoing installations all provide for an individual pipe connection to each consumer served, there is still another plan which may be used to advantage, namely, that of running service pipes for a group of buildings through the basement walls. This method is considerably cheaper than that of providing additional service pipes, but it has the disadvantage that a failure of the main service will interrupt the supply

of electrical energy to all of the consumers connected to it.

Use of Pipe-Forcing Jack.

It is frequently found necessary to install service pipes under cement sidewalks and paved highways,

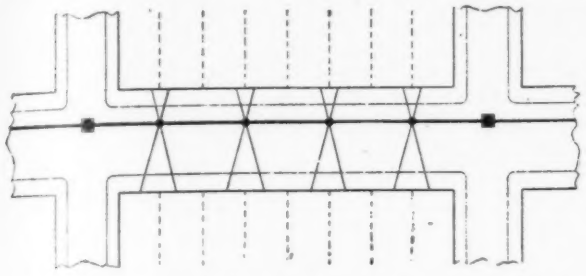


Fig. 4.—Service Manholes and Connections, Single-Conduit System.

where it is impossible to obtain permission to tear up either the sidewalk or street for the purpose of installing the necessary service connections. Since such installations require a permit and the expenditure of considerable money for the restoration of the pavement, the use of a pipe-forcing jack will be found convenient and economical.

This jack is specially designed for forcing pipe horizontally through the ground and may be used advantageously in locations where there are few other subsurface structures to interfere with its operation. The jack, which is illustrated in Fig. 7, consists of a carriage which travels on a track so designed that when the carriage reaches the limit of its travel it can be drawn back to the starting point for the inserting of another section of pipe.

Under favorable soil conditions the jack, when equipped with a driving point as illustrated, will force pipe for a distance as great as the usual service run. Care should be taken, however, in using the jack to avoid damaging any foreign subsurface structure and the location of such structures should always be determined before starting any operations, in order that no interference will be met with.

Installation of Service Laterals Before Buildings Are Served.

In many cities when improved forms of permanent pavement are about to be laid, it is customary to anticipate such work by installing duct lines before the pavement is completed, and in such cases it is well to

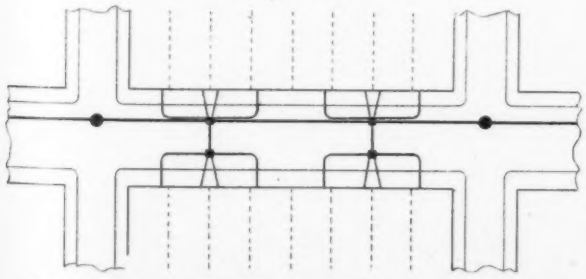


Fig. 5.—Service Manholes and Laterals With Crossings.

install service pipes to all buildings, including those not served at the time of building the line.

These pipes are installed in anticipation of additional business and the cost of providing for their installation represents a large part of the total underground investment. In order to lessen this cost the pipes are often extended from the service hole only to the curb line, in which case a future extension does not require the opening up of expensive pavements.

Wooden plugs or metal caps should be placed at the end of the service pipe to prevent earth or other material from entering the pipe when the excavation is being refilled.

It is essential that an exact record of such pipes be kept in the operating office of the company to facilitate their location and extension to the consumers' premises.

As an added convenience in locating such pipes, a permanent mark at the curb should be made. This can best be accomplished by the use of service markers, which consist of an iron rod driven into the ground at the end of the service pipe. The rod is capped with a cast-iron plate on which is stamped such information as the class of service, or similar data.

Use of Common Service Boxes.

In cities where business districts are springing up, but where the development has not reached a point justifying the erection of large buildings, it is usual to build one or two-story structures of comparatively

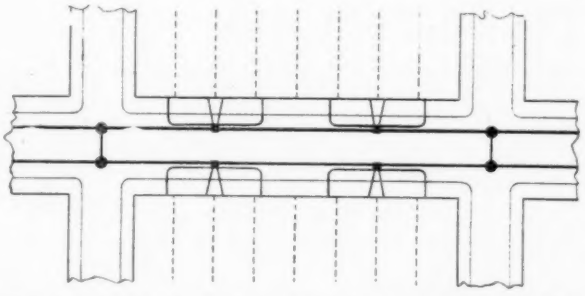


Fig. 6.—Service Manholes and Connections, Double-Conduit System.

low cost. In general the load on such buildings or groups of buildings is small, necessitating a special form of construction if the service is to show a profit.

The cost of furnishing service may be cut down by the use of a common service box from which leads are run to each individual consumer. This service box, illustrated in Fig. 1 is located at some convenient point easy of access for repairs, re-fusing or emergency disconnections.

This form of construction is particularly desirable where new buildings are being erected, as the service pipe and box can be provided shortly after building operations are started. In Fig. 2 is shown the service box set in place prior to the erection of the building wall, and Fig. 8 shows the same box wired up complete after the building work has been finished.

In installations of this character, the owner of the building takes care of all wiring from the service box, including the common main and separate connections to the individual premises to be served.

The main is installed in conduit and may be run under the floors, in the building walls, or wherever conditions make it most convenient.

In Fig. 9 is shown a block of one-story store buildings in which the solid line indicates the underground connection from the manhole to the service box, and the dotted lines the construction which would have to be provided either underneath the sidewalk or in the street in order to serve a group of stores by the usual

method. It is readily seen from this illustration that by this method a considerable investment saving is accomplished and where installed in conduit, as required by the fire underwriters, no additional fire risk is introduced.

In residential sections where real-estate promoters

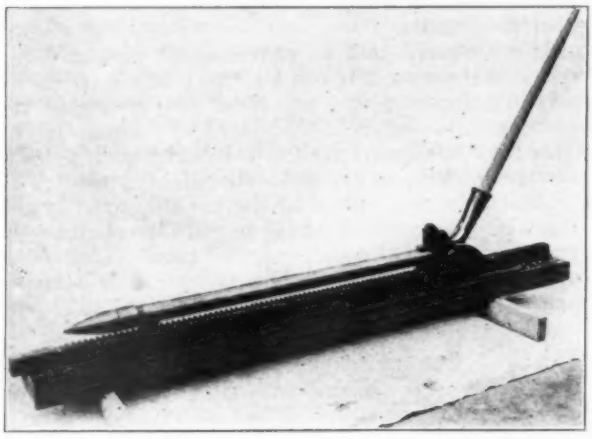


Fig. 7.—A Pipe-Forcing Jack.

have built blocks of houses, for which it is desired to provide underground construction, a system of sidewalk distribution is frequently employed, as illustrated in Fig. 10. This form of construction is considerably cheaper than street distribution, as the conduit and service holes may be laid under the grass plot usually found between the sidewalk and curb line.

Sometimes service boxes are sunk beneath the sidewalk level, a record of their exact locations being kept so as to quickly locate them in case of emergency.

In other installations boxes are supplied with a cover set flush with the sidewalk. This may be easily

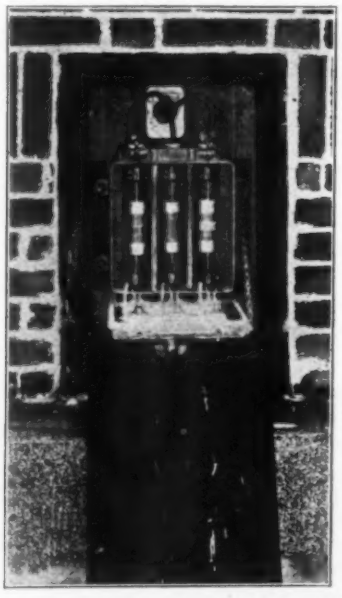


Fig. 8.—Service Box Installed Complete.

removed for the purpose of installing additional wires or making changes in the existing circuits. The conduit in such installations is usually of fiber, but iron pipe or wood duct may be used if desired. No concrete or other foundation is provided for the conduit. This greatly reduces the cost of installation.

Where companies feel that the revenue will not justify such expenditure on their part, an agreement is sometimes made whereby the owner will do the work inside the curb line in accordance with plans and specifications submitted by the company, the owner furnishing all labor and material in connection with the conduit and boxes, the cable and remaining material being furnished by the company. The company has free and unrestricted use of the subway manholes and other structures installed under such an agreement.

Kinds of Wire and Cable Used for Service Connections.

While the use of wire which is not protected by a lead sheath is not recommended for underground work, a number of installations have been made where a good quality of rubber-insulated wire has been used without a protective covering of lead.

On low-voltage secondary systems, rubber-covered wire installed in fiber or other pipe has given reasonably satisfactory results, and cases are known where installations of this character have been operating over a period of ten years without failure or deterioration of the insulation on the conductors.

Rubber-covered wire has the advantage of not

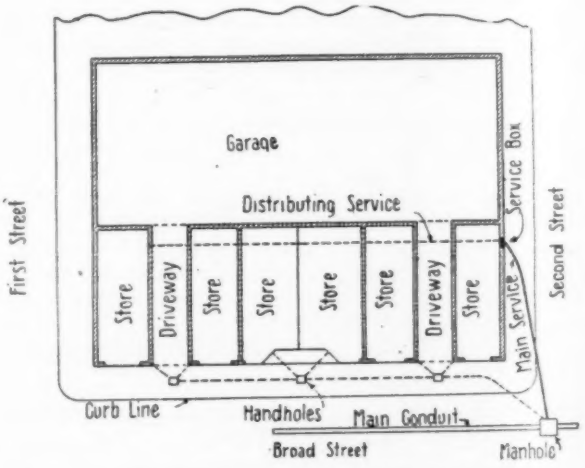


Fig. 9.—Lateral Connections From Manhole to Service Box.

requiring the employment of an experienced cable jointer, no lead wipe being necessary, with the result that connections may be made by an ordinary wireman.

In such installations, only the best quality of rubber-covered wire should be used and the joints should be well taped with rubber compound and protected with friction tape and insulating paint. Where this construction is used the duct joints should be made waterproof to avoid, as far as possible, the action of wet and dry conditions on the insulation.

A modified form of sidewalk distribution is one in which a single duct is laid and "Y" connections, as illustrated in Fig. 11, installed in series with the duct opposite each house to be supplied with service. The main run of duct is 3 inches in diameter and the branch connection is reduced through a 2-inch coupling for connection to the consumer. In installations of this kind, the amount of service pipe is consider-

ably reduced and as many as nine service connections may be run to a single-box.

When installing service wires in a distribution system of this type the service wires are pulled in the branch pipes from the house to the service box. One company estimates that this method of construction results in a saving of from $1 to $3 per service over the former method of providing individual service pipe from the service hole to each customer.

In an attempt to lessen the cost of underground construction, some companies have devised special means of serving customers, such as the burying of wires, covered with an asphaltic compound, laid directly in a trench. In Fig. 12 is illustrated a method which consists of weatherproof wires laid in fiber tubes filled with insulating compound.

The conduit is laid directly in the ground without concrete but with a protection of planking laid directly on the fiber tube. This type of construction is inexpensive and is particularly desirable for long service installations run across private estates and parkways.

Armored cable with or without lead sheath, laid directly in the ground, has also been used quite extensively. It has many advantages in cities where service requirements are of a difficult nature and subject to radical changes and it can readily be installed in places where the drawing-in system would be impossible

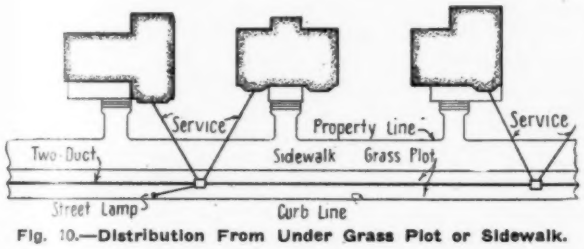


Fig. 10.—Distribution From Under Grass Plot or Sidewalk.

owing to the necessity of passing around large obstacles such as rocks and trees.

Installations of steel-armored cable have been in service for a number of years and have operated very satisfactorily. The use of this cable, however, is not recommended under improved street pavements on account of the difficulty of making repairs in case of a burnout.

Public Utility Work of the Bureau of Standards.

For a number of years the Bureau of Standards, Washington, D. C., has been devoting itself more and more, in one of its branches, to matters dealing with public utility service. This work has now become so extensive and so important that a special circular (No. 68) has been issued entitled "Public Utility Service Standards of Quality and Safety." This circular briefly reviews the various utility activities of the Bureau, which include (1) scientific and engineering research, (2) public relations questions, (3) preparation of specifications regarding quality of public utility service, (4) investigation of methods of testing and inspection employed by municipalities and commissions, (5) preparation of safety rules to safeguard employees of utility companies and the public, (6) collection and distribution of information by published papers and special correspondence.

Among the accomplishments that have been most advanced in this line are enumerated the following: Compilation of Standards for Electric Service, which is published as circular No. 56, and gives a comprehensive statement of the principal factors entering into good service and of rules and regulations for insuring satisfaction. A similar publication on Standards for Gas Service has been prepared as circular

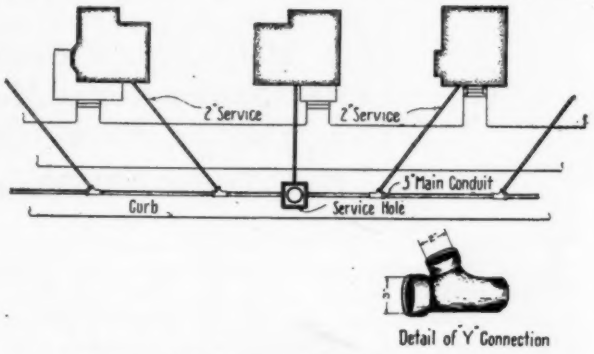


Fig. 11.—"Y" Connected Service Installation.

No. 32 and covers the service of gas utilities in its many phases. A special circular (No. 48) deals with Standard Methods of Gas Testing. The National Electrical Safety Code, already well known to most utility men, is published as circular No. 54, comprising 323 pages. The Bureau has given much attention to the subject of mitigation of electrolysis and has made extensive investigations in over a dozen cities where surveys have been made, ranging from preliminary tests to detect the presence of electrolysis, to complete surveys with design of mitigative systems.

Work now in progress by the Bureau in the line of utility investigations includes the preparation of a national gas safety code, similar in general scope and purpose to the National Electrical Safety Code; although considerable work has been done on this code it is not yet ready for publication. Much work has been done in the preparation of a special circular on street lighting, which will give in considerable detail the technical details for street-lighting installations and model contracts, which will be of value to cities entering into new contracts. Experimental studies have been made of telephone apparatus, testing of such apparatus and means for determining how the different grades of telephone service can be improved through standard service specifications without burdening unduly the operating companies. The Bureau is constantly making special investigations in utility

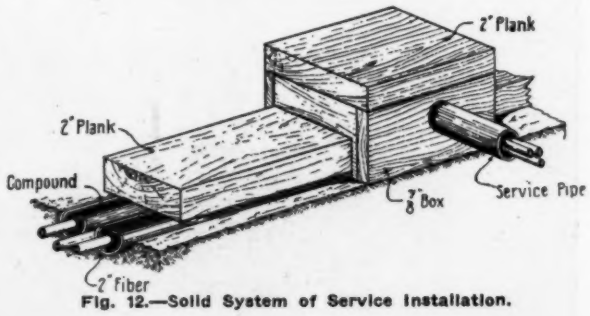


Fig. 12.—Solid System of Service Installation.

matters and is ready to co-operate with state and municipal officials and municipal engineering associations, so as to act as a co-ordinating agency in bringing about uniform standards of practice and requirements in public utility regulations.

Electrically Operated Pumping Stations at Rochester

How Motor-Driven Centrifugal Pumps Served from Central-Station Lines Make Efficient Combination, as Described in Rochester Gas and Electric News

By SYDNEY ALLING and JOHN H. ALLINGTON

THE Rochester & Lake Ontario Water Company is operating a system supplying Lake Ontario water to a large territory east and north of the old city limits of Rochester, N. Y. This territory includes the 23rd ward, East Rochester, Fairport, Charlotte, Summerville and the territory north to the Ridge Road. Several large industrial plants take considerable quantities of water, among these being the Kodak Park plant of the Eastman Kodak Company, and also various plants at Lincoln Park. The New York Central and the Buffalo, Rochester & Pittsburgh railroads are also large consumers. The continuous extension of the system of the Rochester & Lake Ontario Water Company has helped make possible the great suburban growth of Rochester.

The pumping station is located on the shore of Lake Ontario about one and a quarter miles west of Lake Avenue, Charlotte. The water to be distributed is taken from the lake through a 24-inch cast-iron intake pipe which extends into the lake 4000 feet from the shore. The water is drawn through this intake and pumped into the sedimentation basin by a 16-inch centrifugal pump driven by a 75-horsepower squirrel-cage induction motor. The engine-driven centrifugal pump is held in reserve for this work. Before the water reaches the low-lift pumps it is treated so as to destroy any plant or animal life, and precipitate any solids which may be carried in solution. The sedimentation basin consists of four long wooden tanks in series through which the water flows at very low velocity and any large particles carried by it are deposited here. From the basin the water flows by gravity to two suction wells from which it is taken by the suction lines of the high-pressure pumps.

The original high-pressure pumping equipment consisted of two Wetherell steam pumps, cross compound on the steam end and duplex on the water end, each having a nominal capacity of 3,000,000 gallons in 24 hours. The actual capacity of each pump however is about 2,750,000 gallons per 24 hours. The steam for these pumps was supplied by four 300-horsepower Babcock & Wilcox water-tube boilers. From the high-pressure pumps the water passes through eight high-pressure sand and gravel filters connected in parallel, and then to the high-pressure main.

The distribution main which is a 20-inch cast-iron pipe line with bell-and-spigot joints follows a general

Fig. 1.—General View of Motor-Driven Centrifugal Pumps in Pumping Station of Rochester & Lake Ontario Water Company. Large Pump Is a Five-Stage Unit. In Foreground Is a Single-Stage Booster Pump.

southerly route from the station, running for the most part along the right of way of the Buffalo, Rochester & Pittsburgh Railroad to Lincoln Park, then east along the New York Central Railroad through the city

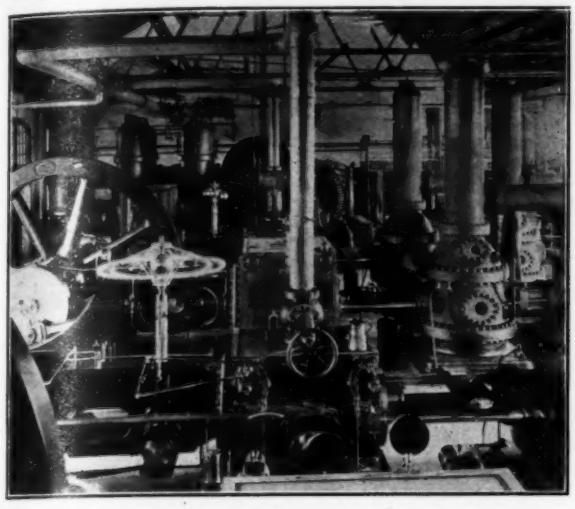


Fig. 2.—General View in Pumping Station. In Foreground Are Large Steam-Driven Units. The Variable-Stroke Electric Pump Is in Background.

and south again to the reservoir on Cobb's Hill. This reservoir is a circular steel-plate tank having a capacity of 3,000,000 gallons and is located about 750 feet northeast of the city reservoir. It insures a steady supply of water to the consumers of the company when the pumps at the lake are shut down, and also serves to stabilize the pressure on the system at all times.

Large Synchronous-Motor-Driven Pump.

The load of the water company increased to such an extent that in 1912 it became necessary to arrange for additional pumping equipment. Accordingly, a variable-stroke pumping engine, having a capacity of 6,000,000 gallons per 24 hours was purchased from the Nordberg Manufacturing Company, and installed

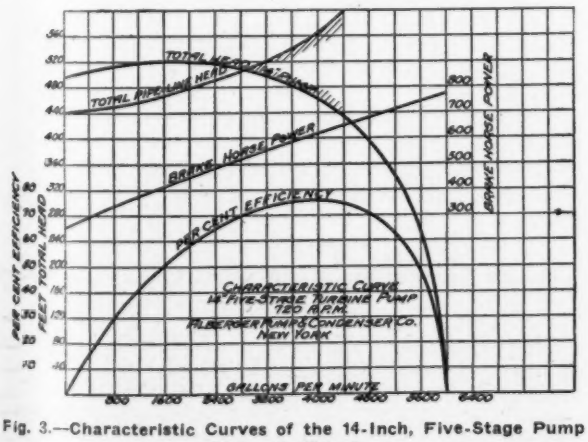


Fig. 3.—Characteristic Curves of the 14-Inch, Five-Stage Pump Shown in Fig. 1.

at the north end of the engine room. This pump is driven by a 600-horsepower synchronous motor through herringbone gearing. To supply the electric power, a three-phase, 25-cycle, 11,000-volt transmission line was built to the pumping station where a bank of three 300-kilovolt-ampere transformers was installed. The transformer bank serves the 600-horsepower synchronous motor, the 75-horsepower induction motor driving the low-lift pump and a 200-kilowatt rotary converter, which supplies power to the Manitou Beach Railway.

In 1915 it was decided to use the Nordberg pump for standby service and install motor-driven centrifugal pumping equipment for continuous operation. This decision was based on the fact that the first cost and maintenance expense of centrifugal equipment is very much lower than for an equivalent reciprocating unit. A centrifugal pump is somewhat less efficient than a plunger pump, but it was felt that the above-mentioned advantage would more than offset the lower efficiency.

To understand the operation of the centrifugal pumping equipment, an explanation of the load conditions at the pumping station is necessary. The pipe line connecting the pumping station to the reservoir is 13 miles long, with customers tapped off at various points throughout the run. The static head at the pumping station is 173 pounds, and when pumping at the rate of 6,000,000 gallons per 24 hours, or 4200 gallons per minute, the pipe-line friction causes the pressure at the pumping station to rise to about 245 pounds. The friction head is less at lower rates of

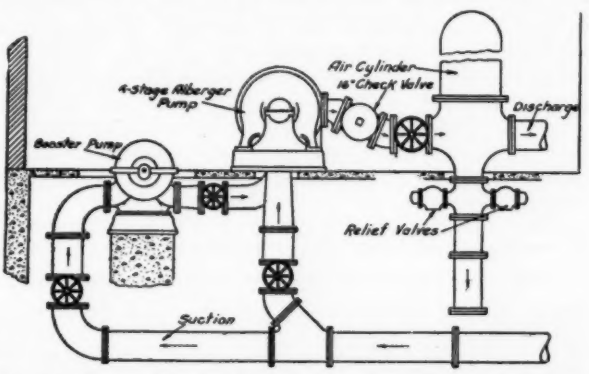


Fig. 4.—Arrangement of Piping of Booster Pump (Driven by Variable-Speed Direct-Current Motor) and Five-Stage Pump (Driven by Constant-Speed Alternating-Current Motor).

pumpage, and it also varies to some extent with constant pumpage, depending on whether the water is being sent all the way to the reservoir or is used by consumers at some intermediate point.

These conditions are very unfavorable for the efficient operation of a constant-speed centrifugal pump in which the relation of head and volume follows a definite curve, and pressure control could only be effected by throttling. A pump driven by a variable-speed motor would have accomplished the desired result, but no efficient variable-speed alternating-current motor is available in large sizes.

It was therefore decided to install two pumps in series. The first, or high-pressure pump, is driven at constant speed by a squirrel-cage induction motor and is designed to supply 4200 gallons per minute against 190 pounds pressure. The second, or booster pump, is connected to the suction of the high-pressure pump, and is driven at variable speed by a direct-current motor. The booster pump supplies the variable pressure necessary to accommodate the changing conditions on the pipe line. The curves in Fig. 3 show the relation between the total pipe-line head and that supplied by the high-pressure pump. It will be noticed that as the pump pumps more than 2900 gallons per minute the pipe-line pressure rapidly becomes much

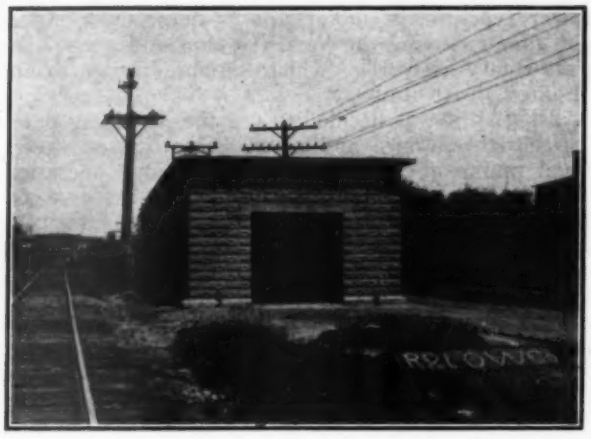


Fig. 5.—Exterior View of Booster Pumping Station.

Fig. 6.—Interior of Booster Station. A 16-Inch Single-Stage Centrifugal Pump Driven by 200-Horsepower Induction Motor.

greater than the total head of the pump. The shaded area represents the additional head which must be supplied by the booster pump.

To accommodate the new pumping units, an addition was built on the west side of the pump room. The new building was constructed of concrete blocks tinted to match the Medina stone of the main building. All the foundations are composed of concrete, while the roof consists of reinforced concrete carried on structural steel. The new addition houses the two centrifugal pumps with their control equipment and a 300-kilowatt rotary converter for furnishing direct current to the booster-pump motor and the Manitou Beach Railway.

HIGH-PRESSURE AND BOOSTER CENTRIFUGAL PUMPS.

The first high-pressure centrifugal pump installed was a 12-inch three-stage pump built by a well-known pump company. After installation, it was found that a bad distortion of the pump case was produced by the water pressure and careful tests showed the efficiency was very much below that guaranteed. These defects caused the rejection of this unit.

The present high-pressure pump was built by the Alberger Pump & Condenser Company. It is a five-stage 14-inch pump running at 730 revolutions per minute and direct connected on a common bedplate to a 600-horsepower General Electric squirrel-cage induction motor. The shaft is supported by pedestal bearings, the outer bearing being a "marine thrust." At the discharge end of the pump, there is installed a 16-inch check valve to protect the pump from water hammer in case of a sudden shutdown. A large air chamber with two 6-inch relief valves is installed on the discharge line to protect the piping from water hammer. Fig. 4 shows the general arrangement of piping for the centrifugal pumps, and Fig. 1 is a good general view of the equipment in the new addition.

The booster pump is a 12-inch single-stage, double-suction pump built by the De Laval Steam Turbine Company. It is driven by a 200-horsepower, 600-1200 revolutions per minute variable-speed direct-current motor and at 1200 revolutions per minute has a capacity of 4200 gallons per minute against a maximum pressure of 60 pounds.

While installation work on the centrifugal equipment at the lake station was in progress, it became evident that some step would have to be taken to increase the pipe-line capacity to the city. As the cost of material for a new pipe line was very much above normal at this time, it was decided to increase the capacity of the existing pipe line by installing a booster pumping station at the Ridge Road.

MOTOR-DRIVEN BOOSTER PUMPING STATION.

A concrete-block building with reinforced-concrete roof, as shown in Fig. 5, was erected adjacent to the pipe line about 200 feet north of the Ridge Road on the right of way of the Buffalo, Rochester & Pittsburgh Railroad. One room in this building contains three 75-kilovolt-ampere 11,000/12,300-volt, 25-cycle transformers and the necessary metering and switching equipment. In the other room is installed a 16-inch single-stage Alberger pump direct-connected to a 200-horsepower General Electric squirrel-cage induction motor (Fig. 6). The pump is designed to handle 5900 gallons per minute against 43 pounds pressure. Valves and piping are arranged so that this unit can be cut in series with the pipe line at any time without interrupting the flow. It enables the water company to handle a pumpage of 6,000,000 gallons per day with a much lower pressure at the lake station. If a pressure of 245 pounds were carried at the lake station, as was done before the booster plant was installed, the pipe line with the booster plant operating would be capable of passing 8,500,000 gallons per day, an increase of 40 per cent. This is one method of helping to conserve the nation's iron and steel which can be better used toward the successful conclusion of the war.

The centrifugal-pump installations of the Rochester & Lake Ontario Water Company were designed by and installed under the supervision of the Industrial Department of the Rochester Railway & Light Company.

Chicago Electric Suburban Lines to Establish Fast Freight Service.

Representatives of a score of electric interurban railways around Chicago have planned to form through lines to relieve freight congestion in the Chicago district and to enter into direct competition with steam roads, by establishing fast freight service between Chicago and Rockford, Milwaukee, South Bend and Indianapolis. Rockford service will be over the Aurora, Elgin & Chicago and the Rockford, Interurban and connecting roads, and is expected to assist the Government in moving supplies to Camp Grant. Milwaukee service will be by the way of North Shore Line and Elgin, Joliet & Eastern Railroad. A committee is working out the details.

Training Crippled Soldiers as Substation Attendants

Success of Plan in Great Britain Insures Feasibility in This Country—Details of Course of Instruction

By DOUGLAS C. McMURTRIE

Acting Director, Red Cross Institute for Crippled Soldiers and Sailors.

ALL of the belligerent countries are deeply interested in the training of crippled soldiers who, though debarred by their disability from following their former trade, may be trained for a new one at which they can earn a living. Men who in the past depended for their livelihood on the exercise of physical strength may be trained for an occupation where skill, rather than brawn, is at a premium. Those who, before the war, followed trades requiring great activity, may be prepared for a work which may be done while seated.

In Great Britain instruction in preparation for positions as electrical substation attendants has been decided upon as suitable for certain types of war cripplies.

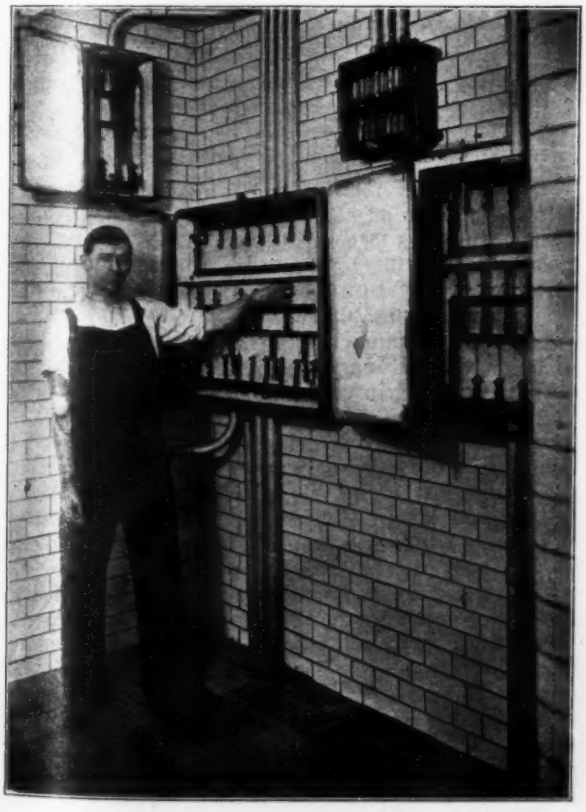
The Institution of Electrical Engineers took the initiative in this field and, in co-operation with the London public education authorities, established classes at the Northampton Polytechnic Institute. Up to the present time over 150 men have been trained.

Course of Training.

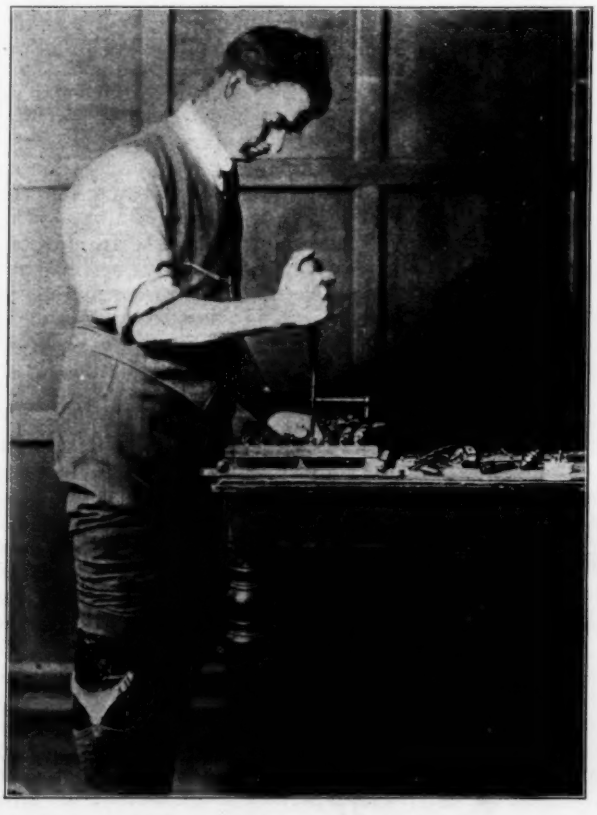
The course of training consists of workshop practice in wiring and the use of simple tools, power-house demonstrations, electrical and physical laboratory work, class demonstrations in the elements of electrical engineering and of simple engineering physics, the preparation of reports upon the demonstrations and on the laboratory work, and an oral examination at the conclusion of the course.

The workshop practice includes the use of ordinary hand tools and the jointing of wires and of stranded cables. In addition, the men are required to dismantle and re-assemble arc-lamp mechanisms, and so forth.

The power-house demonstrations are, for the most part, given in the power house, which forms part of the electrical-engineering equipment of the Institute and is itself a miniature of a modern central station, with substation attached and equipped for dealing with both direct-current and three-phase alternating-current machinery and switch apparatus. Demonstrations are given on switching operation, paralleling, synchronizing, etc., the men being taken in small groups to a particular machine, engine or switchboard, and allowed to examine and handle every part, detailed



Substation Operator with One Arm Missing.



Crippled Soldier Engaged in Bench Work.

explanations being given of the construction and use of each piece of apparatus or machinery. This has proved a very important part of the work, and any institution which has not a modern power-station equipment would be very much handicapped in carrying on similar courses.

Following up the power-house demonstrations in the Institute, the men visit in small groups the substations of some of the London electric supply companies. In these, very valuable assistance is given to the instructions by the station engineers in charge.

It will be realized that it is essential that all explanations of the above demonstrations should be given, as far as possible, in non-technical language, and should avoid the use of special terms.

Laboratory Instruction Included.

In the laboratory the men begin with some of the usual simple experiments in magnetism, the measurement of resistance by ammeter and voltmeter, the instruments used throughout being of commercial pattern and not of the usual laboratory design, such as tangent galvanometers, and the like. From these they proceed to work with small motors of a few hundred watts capacity, using again ordinary commercial types of instruments and switches.

Ten class demonstrations, each an hour and a half in length, deal with the first principles of electrical-engineering practice, and are followed, after a half-hour rest, by a period of one hour during which the students, under supervision, are required to write out notes of the points dealt with in the demonstration. The scope of the lectures is very carefully limited to the most elementary first principles, and each point is illustrated by cases taken from substation and generating-station practice, in which the principle under discussion is involved.

The writing of reports is an important part of the training. Many of the men found this work irksome at first, but practically without exception they soon recognized its value, and some even became enthusiastic about it. The main aim is to induce the habit of making business-like reports and records, and the methods followed have the advantage of fixing in the men's minds a more definite and orderly impression of the instruction given them than could otherwise be obtained.

Two half-days at the end of the course are devoted to an oral examination of the class. The questions are made as simple as possible, and before attempting to answer a question a student has first to explain what he understands by it. Special emphasis is given in the examination to safety appliances of all kinds.

Qualifications of Students.

Regarding the class of disabled soldiers suitable for this electrical training, the Minister of Labor has recently directed attention to the conditions of labor in a substation. In no case should a man work there who is suffering from a nervous breakdown or who has a weak heart. The work could be done by men who have lost one leg, so long as they could stand for at least two hours at a stretch. It could also be done by men who have lost the sight of one eye so long as the other eye is normal. Good hearing is essential, and a sense of smell is also needed in case of burning. There are also a few substations where there is no running machinery, where the work could be done by men who have lost either their right or their left arm so long as they have the full use of their other arm, hand and fingers. The work is medium to light in character and is carried on in an equable indoor temperature. There is in some cases considerable noise and vibration. The work does not require much handicraft skill, and could be taught to a man who had formerly been accustomed to unskilled work, so long as he was generally intelligent and adaptable. A man must be able to keep records, add up figures, and use the telephone. While it is desirable that the men should be under 35, men of 40 or even over can, in some cases, learn the work successfully.

The number of students in any class is limited to 20. The training must be intensive and largely individual, and a larger number cannot satisfactorily be handled by a single teacher.

Cost of Training Slight.

Aside from the classroom, shop and laboratory facilities already existing at the Northampton Polytechnic and the voluntary assistance by the power stations visited, the principal cost consists in the remuneration of the special teachers required. Each course has covered a period of four weeks, for which the salary expense has amounted to about $100.

There has been no trouble whatever in placing the graduates at they complete their course. In many cases these disabled soldiers have been able to take up work which has released younger and able-bodied men for service at the front. The results have been satisfactory, for all the power companies which employed graduates of the earlier classes have since applied for more.

The United States will be under necessity of providing training for crippled men of her own forces. Interest in the question is growing daily. The Red Cross Institute for Crippled Soldiers and Sailors has already been established in New York City, committees with similar purposes have been organized in Boston, Chicago and other cities. The Surgeon-General's Office is planning the establishment of training schools in connection with the base hospitals.

The successful English experience in the training of electrical workers should be helpful in the organization of American work for the war cripple.

Federal Census of Electric Utilities Under Way.

The quinquennial series of inquiries relating to central electric light and power stations and street and electric railways began in 1902. The next federal census, which will relate to 1917 and will be taken in 1918, will cover, with respect to central electric light and power stations, the following: Number of commercial and of municipal stations, finances, character of ownership, primary power and dynamo capacity, stations operated in connection with electric railways, equipment, output, and number of customers. In respect to street and electric railways the inquiry will relate to finances, primary power, equipment and output of stations, track mileage, rolling stock, employees, salaries and wages, traffic, etc. A preliminary report, in bulletin form, will be issued late in 1918 or early in 1919, and the complete report will follow later.

The census of telephones, telegraphs and fire-alarm and police-patrol signaling systems is made in connection with that relating to electric light, power and transportation, and its results, which will be published at about the same time, will include statistics in respect to finances, traffic, equipment, employees, salaries and wages, etc., for the Bell, independent, and governmental telephone systems and for commercial and governmental land, ocean-cable, and wireless telegraph companies.

The Magnetic Circuit—III

Discussion of Some Magnetic Properties of Iron—Other Magnetic Terms and Formulas Explained

By TERRELL CROFT

This is the third section of an article appearing in five parts and giving for non-technical readers a simple explanation of the principal phenomena and laws of the magnetic circuit. This section continues the discussion of the fundamental facts and leads to the treatment of the design and calculation of simple magnetic circuits, which will be taken up in more detail in the two remaining sections.

BY *magnetomotive-force gradient* or *magnetic intensity*, the symbol of which is H, is meant a quantity analogous to voltage gradient or electric intensity in an electric circuit. In a magnetic circuit, the magnetomotive force is "consumed" gradually along each inch length of the circuit in a way similar to that in which the voltage impressed on an electric circuit may be considered as being consumed in each unit length of the circuit conductor. The magnetomotive-force gradient is, then, a quantity indicating the magnetomotive force expended per unit length of the magnetic path. The real significance of magnetomotive-force gradient is explained in a following paragraph. Thus:

(20) $H = M/l$ (ampere-turns per inch length)
(21) $M = H \times l$ (ampere turns)
(22) $l = M/H$ (inches)

The following example illustrates the foregoing definition: If a magnetic circuit is 40 inches long and is excited by a magnetomotive force of 2000 ampere-turns, the average magnetomotive-force gradient in this circuit would be (equation 20) $H = M \div l = 2000 \div 40 = 50$ ampere-turns per inch length.

Flux density is the number of lines of force per unit area passing through any substance through a plane at right angles to the direction of the flux lines. In practical work in the United States flux density is measured in *lines per square inch* and is usually designated by the letter B. With a uniform distribution of flux through the magnetic path:

(23) $B = \phi/A$ (lines per square inch)
(24) $\phi = B \times A$ (lines)
(25) $A = \phi/B$ (square inches)

wherein all of the symbols have the same meanings as before given, except that B = flux density in lines per square inch.

Magnetic Properties of Iron.

The magnetic saturation of iron, that is, its ability to carry lines of force, may be likened to the ability of a sponge to absorb water. When there is very little

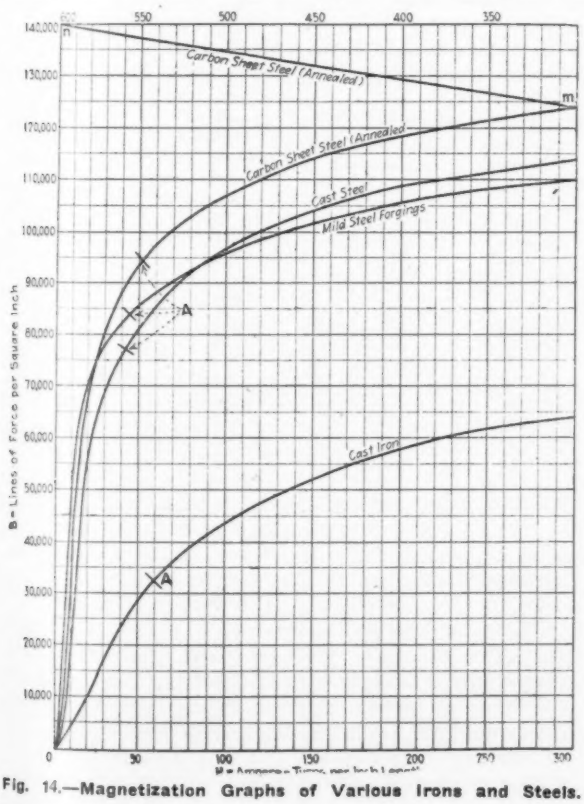


Fig. 14.—Magnetization Graphs of Various Irons and Steels.

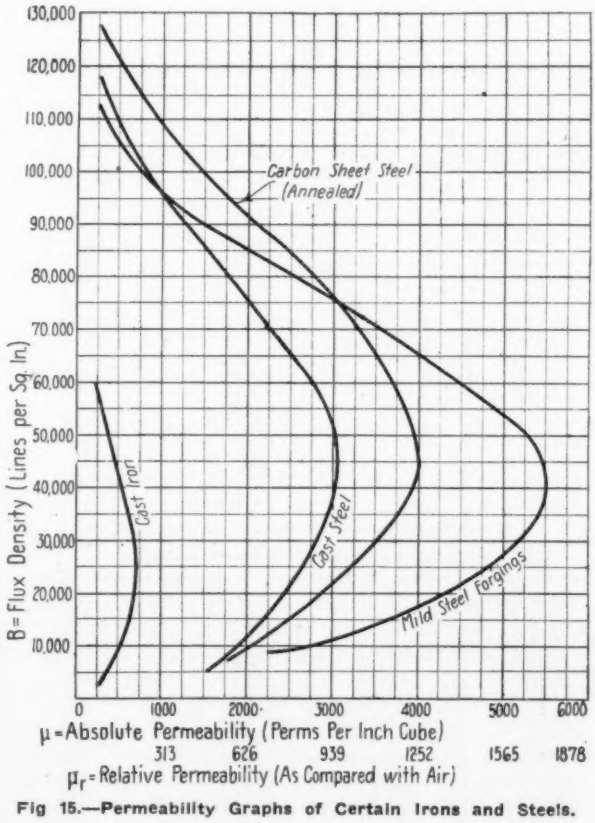

Carbon Sheet Steel (Annealed)
Cast Iron
Cast Steel
Mild Steel Forgings
B = Flux Density (Lines per Sq. In.)
μ = Absolute Permeability (Perms Per Inch Cube)
μr = Relative Permeability (As Compared with Air)

Fig 15.—Permeability Graphs of Certain Irons and Steels.

water in the sponge it will readily soak up more, but when the sponge is almost saturated, it will absorb additional water only with difficulty. Likewise, with iron, Fig. 14, when the flux density is low, a slight increase in magnetomotive-force gradient (or magnetomotive force) will cause a material increase in the flux density or in the number of lines of force per square inch. However, when the flux density is high, it requires a great increase in magnetomotive force to produce a material increase in flux density.

The flux density beyond which it is impracticable to magnetize a magnetic material is called the magnetic saturation point of that material. It is possible to magnetize magnetic materials beyond their saturation points, but the magnetomotive force required to effect such magnetization is then out of all proportion to the magnetization obtained. The approximate location of the saturation points on the graphs of Fig. 14 are indicated by the letters *A*.

Referring to the values for mild-steel forgings of Table *I*, reproduced herewith for convenience (which values are those from which the graphs of Fig. 14 were plotted), a magnetomotive-force gradient of $7.20 - 5.64 = 1.56$ ampere-turns per inch length is required to effect a net increase of 10,000 lines per square inch (from 30,000 to 40,000) in flux density because a flux density of 40,000 lines per square inch is below the saturation point. However, a magnetomotive-force gradient of $134.7 - 62.6 = 72.1$ ampere-turns per inch length is required to increase the flux density from 90,000 to 100,000 lines per square inch, because the latter flux density is considerably above the saturation point. It requires about 46 times as great a magnetic gradient in one case as in the other.

An explanation of the application of Table *I* of magnetic properties of iron and steel may be desirable. The columns headed *H* show the number of ampere-turns required for each inch length of magnetic circuit to produce through each square inch of sectional area of the magnetic circuit the corresponding flux density *B*. For example, see the first line and section of the table: 5.01 ampere-turns per inch length will produce through each square inch sectional area of the carbon sheet-steel magnetic circuit 10,000 lines.

The striking contrast in magnetic properties of iron (or iron products) and air is shown by a comparison of Table *I* and Table *II*. In the latter the values under *B* were computed by substituting different values for flux density in formula (33) $H = B \div \mu$. That is, for air, $H = B \div 3.19$, because the permeability of air is always 3.19 perms per inch cube. Thus with *B* taken as equal to 10,000, $H = 10{,}000 \div 3.19 = 3135$.

The permeability of iron is not constant, but varies with the flux density and with the different kinds of iron. A consideration of the permeability values in Table *I* and of the graphs of Fig. 15 (same as Fig. 9) will verify this assertion. When the number of lines per square inch is small, that is, when the flux density is quite low, the permeability of the iron is low. However, this permeability increases as the flux density increases, up to a certain saturation or degree of flux density. At this flux density the permeability of iron is greatest. With higher flux densities the permeability decreases.

For example, consider the values of permeability in Table *I* for mild steel forgings. The absolute permeability at the low flux density of 10,000 lines

TABLE I.—MAGNETIC PROPERTIES OF IRON AND STEEL.
(See Figs. 14 and 15 for graphs illustrating these properties.)

CARBON SHEET STEEL (Annealed)				CAST STEEL			
B Flux Density (Lines per square inch)	H M. M. F. Gradient or Magnetic Intensity (Ampere-Turns per inch length)	μ Absolute Permeability (Perms per inch cube)	μ_r Relative Permeability (as compared with that of air)	B Flux Density (Lines per square inch)	H M. M. F. Gradient or Magnetic Intensity (Ampere-turns per inch length)	μ Absolute Permeability (Perms per inch cube)	μ_r Relative Permeability (as compared with that of air)
10,000	5.01	1996	625	10,000	5.64	1774	556
20,000	7.20	2775	870	20,000	8.77	2278	714
30,000	8.77	3416	1,071	30,000	10.9	2791	875
40,000	10.3	3866	1,212	40,000	13.4	2967	930
50,000	13.2	3796	1,190	50,000	16.9	2954	926
60,000	16.6	3611	1,132	60,000	22.5	2657	833
65,000	19.	3420	.....	65,000	26.0	2500	797
70,000	21.3	3283	1,029	70,000	31.0	2255	707
80,000	29.4	2715	851	80,000	45.7	1745	547
90,000	43.2	2080	652	90,000	70.5	1276	400
100,000	67.0	1490	467	100,000	117.4	851.7	267
110,000	117.	937.9	294	110,000	228.6	481.7	151
120,000	227.	526.4	165	115,000	317.9	360.5	113
125,000	365.	370.0	116				
MILD STEEL FORGINGS (Wrought Iron)				CAST IRON			
10,000	3.76	2657	833	10,000	20.0	497.6	156
20,000	4.70	4252	1,333	20,000	32.9	609.3	191
30,000	5.64	5091	1,596	30,000	51.4	583.4	183
40,000	7.20	5547	1,739	40,000	82.1	488.1	153
50,000	9.40	5318	1,667	50,000	134.	370.0	116
60,000	13.9	4351	1,364	60,000	224.	266.7	83.6
65,000	16.0	4070	1,275	65,000	322.	201.3	63.1
70,000	20.4	3436	1,077				
80,000	32.6	2453	769				
90,000	62.6	1436	450				
100,000	134.7	743.2	233				
105,000	197.2	532.7	167				
110,000	324.2	338.1	106				

per square inch is 2657 perms per inch cube. At the flux density of about 40,000 lines, the permeability is then 5547 perms per inch cube, which is about the maximum permeability obtainable with this sample of mild steel. Now, as the flux densities increase still further, the permeability decreases until at a flux density of 110,000 lines the permeability is then 338.1 perms per inch cube.

TABLE II.—MAGNETOMOTIVE-FORCE GRADIENTS TO PRODUCE DIFFERENT FLUX DENSITIES IN AIR.

B Flux Density (Lines per square inch)	H M. M. F. Gradient (Ampere-turns per inch length)	B Flux Density (Lines per square inch)	H M. M. F. Gradient (Ampere-turns per inch length)
5,000	1,567	60,000	18,810
10,000	3,135	65,000	20,377
15,000	4,702	70,000	21,944
20,000	6,270	75,000	23,512
25,000	7,837	80,000	25,080
30,000	9,404	85,000	26,647
35,000	10,972	90,000	28,214
40,000	12,540	95,000	29,782
45,000	14,107	100,000	31,350
50,000	15,675	105,000	32,917
55,000	17,242	110,000	34,485

Table *I* showing magnetic qualities of iron and steel indicates values for the grades of these materials that are ordinarily obtainable around the average shop. Different grades of a certain material, mild steel, for example, will have different magnetic qualities. Irons may be obtained that show materially better values than those of Table *I*. On the other hand, some irons show values that are much worse. Irons that have exceedingly good magnetic qualities may be so expensive that their commercial application is not feasible.

WORKING FORMULAS.

The working formulas for the magnetic circuit, the derivation of which is given below, are as follows:

(26) $$I \times N = \frac{\phi \times l}{\mu \times A}$$ (ampere-turns)

(27) $$I = \frac{\phi \times l}{\mu \times A \times N}$$ (amperes)

(28) $$N = \frac{\phi \times l}{\mu \times A \times I}$$ (turns)

(29) $$\phi = \frac{\mu \times A \times I \times N}{l}$$ (lines)

(30) $$l = \frac{\mu \times A \times I \times N}{\phi}$$ (inches)

(31) $$\mu = \frac{\phi \times l}{I \times N \times A}$$ (perms per inch cube)

(32) $$A = \frac{\phi \times l}{I \times N \times \mu}$$ (square inches)

wherein, I = exciting current, in amperes; N = number of turns in exciting winding; ϕ = the total flux threading the magnetic circuit, in lines; l = the length of the magnetic circuit, in inches; μ = the permeability of the material of the circuit in perms per inch cube; A = the cross-sectional area at right angles to the direction of the flux of the magnetic circuit, in square inches.

The derivation of the above equation (26) is as follows: As based on the fundamental equation (7) $M = R^1 \times \phi$. From equation (1) $M = I \times N$ and also since $\nu = 1 \div \mu$, from (9) $R^1 = l \div (\mu \times A)$. Then substituting these values in the equation given below, it follows that

$$I \times N = \frac{l}{\mu \times A} \times \phi = \frac{l \times \phi}{\mu \times A}$$

Equations (27) to (32) are then readily derived from (26).

In computing the flux in a magnetic circuit formula (6) $\phi = M \div R^1$ may be used as outlined in the examples given in the first column of page 885 of the last issue. However, it is not usually feasible to compute magnetic circuits directly from the formula. The modification, equation (29), of the fundamental formula can, however, be readily applied.

EXAMPLES OF MAGNETIC COMPUTATION.

What flux will be produced in the air-core toroid of Fig. 16, *I*, which has 32 turns, assuming that a current of 5 amperes flows in these turns? The length of the magnetic circuit, that is, the mean circumference of the toroid, is 16 inches. The area of the air core is 2 square inches. Solution.—The permeability of air is always 3.19 perms per inch cube. Hence, substituting in formula (29) $\phi = (\mu \times A \times I \times N) \div l = (3.19 \times 2 \times 5 \times 32) \div 16 = 63.8$ lines.

What flux will be produced in the core of the toroid of Fig. 16, *II*, which is exactly the same as that of the preceding example, except that it has an iron core. Assume the absolute permeability to be 3190 perms per inch cube. Solution.—Since the only difference in the two examples is that the permeability is 3190 in this case instead of 3.19 in the preceding, the flux with the iron core would be 1000 times as great, or $1000 \times 63.8 = 63{,}800$ lines. This example shows how markedly the flux is increased by using iron, instead of air, for the path in a magnetic circuit.

What flux will flow in the magnetic circuit of Fig. 16, *III*? The turns = 16. Current = 10 amperes. Area = 2 square inches. Mean length of magnetic circuit is 16 inches. Assume the permeability of the iron to be 3190 perms per inch cube. Solution.—Substituting in equation (29): $\phi = (\mu \times A \times I \times N) \div l = (3190 \times 2 \times 10 \times 16) \div 16 = 63{,}800$ lines. This (63,800 lines) is the same result as that obtained in the previous example. Inspection would have predicted this, because all of the values, except "amperes" and "turns," are the same in both examples, but the ampere-turns are the same for both problems because $5 \times 32 = 160$ and also $10 \times 16 = 160$. Actually, however, the flux would be uniform in the ring of *II* because the winding is distributed. With *III* there would be some leakage, that is, while 63,800 lines would be developed at *B*, somewhat less than this number, because of leakage, would exist in the lower limb of the circuit.

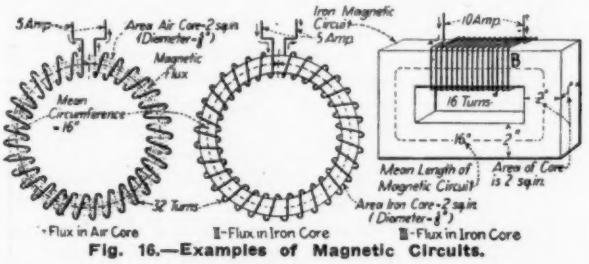


Fig. 16.—Examples of Magnetic Circuits.

(*To be continued.*)

Editorial Comment

C. W. Price Has Not Retired

WE LEARN definitely of statements being made in all parts of the country—by those who assume to regard themselves as our competitors—that Charles W. Price is disposing of his interest in the ELECTRICAL REVIEW and will sever his connection with it the first of the year. As the assertion appears to have been made deliberately and with the intention of injuring the standing of this paper in the electrical field, we wish to say that there is no truth in it.

The ELECTRICAL REVIEW is owned, as it has been for many years past, by the Electrical Review Publishing Co., Inc., of which Mr. Price is, and will continue to be, president. During the past year Mr. Price has materially enlarged his holdings in the publishing field, and, in addition to being president of the Electrical Review Publishing Company, which also issues the Electrical Blue Book, he is chairman of the Board of Directors of the International Trade Press, Inc.

The latter is a holding company for various technical publications as well as directories and trade annuals, including the *Cement World*, the *Cement Era*, *International Trade*, the *Road-Maker*, the *Directory of Cement*, *Gypsum & Lime Manufacturers*, *The Metal Mining Catalogue*, Etc. It is also interested in other publications which it does not control.

This holding company was organized for the purpose of reducing overhead expense, avoiding duplication of labor and costs, and bringing about a degree of co-operation between various related publishing interests which would insure better results to readers, to advertisers and in general to the industries which the papers serve. In all of this work Mr. Price is taking a very prominent part, although his intimate connection with the electrical industries necessarily means the devotion of the greater part of his time and effort to them. The associates of Mr. Price feel that his personality, his knowledge of conditions in the electrical and other industrial fields and the tremendous service which he has rendered in the successive development and up-building of these industries are one of the greatest assets of the business. Neither they nor Mr. Price have any idea of parting company.

Incidentally, we wish to thank those who have brought to our attention the misleading statements above referred to, and we shall be glad to hear of any others that may be made in future, so that we can promptly refute them.

ELECTRICAL REVIEW PUBLISHING CO.,
C. A. Tupper, *General Manager.*
INTERNATIONAL TRADE PRESS, INC.,
Lyman A. Sisley, *Vice-President.*

Keep Cash Where It Will Count Most

FOR the growing necessities of both war and peace an enormous volume of electrical and other supplies are imperatively needed—a volume that in size staggers the imagination.

Where are the materials to come from? Not from neutral countries, because these few remaining lands have already been drained dry of their supplies; hardly through the employment of additional labor, because the labor supply has already been greatly reduced; not to any noticeable extent through the speeding up of labor, nor through the employment of labor for longer hours with consequent exhaustion of efficiency, because labor has definite ideas regarding the terms of its employment and is generally able to enforce them.

The one way out is through intensified applications in industry. This will, of course, mean the erection of new and better-designed buildings, the installation of labor-saving machinery, improvement in factory methods, including electric drives, and all the other things that go to multiply and facilitate human effort.

The revenue law as it now stands contains sections that should definitely lead the prosperous and successful industrial concern to expand and develop its facilities, rather than take the road of least resistance in merely paying excess taxes. Assume the case of a company with a capital of $100,000 and a net income of $50,000. That particular company, if it earned 9 per cent or more during the period before the war, will pay a present war tax amounting to $17,400 or approximately 35 per cent of its net income. Any manufacturer making profits which are reasonably heavy in proportion to its invested capital will be affected similarly.

Now if such a producer determines to spend a portion of his manufacturing profits in extensions and developments, so that he may employ his shop facilities and labor on the highest possible plane of efficiency, he may know that in place of merely contributing cash for taxes, he is bettering the status of his industry and thereby doing a more patriotic thing for his country.

It would, therefore, seem clear that we are in for a period of vigorous industrial development, which in turn will call for further financing of industry. Some restrictions may be placed on new financing, as has been done in England. This, when it comes, should prevent the flotation of new issues for purposes not directly forwarding war work, even including certain state and municipal issues. But, with all due allowances, it may be said that Liberty bonds are not the

only securities which must be sold in this country during the term of the war; nor is cash for such bonds and for taxes the only money that can be profitably applied in aid of the government. As a producing power in industry it can be kept turning over and over, so as to multiply its effects many-fold. Money shown as profit in a business frequently, in fact usually, represents added investment in operating capital or plant facilities. To take any considerable percentage of this out in cash may mean largely curtailing future output. Left in the business it can be used to produce more. This the government should find means to encourage, rather than to take the cash in taxes and sacrifice its further producing capacity in the plant where it was made.

Conservation of Coal

A RECENT war measure put into effect by the Government provides for greatly curtailing the use of display electric signs, restricting their use to between 7:30 and 11 p. m. The greatest benefit from this measure undoubtedly lies in the moral effect which it will have upon the country in emphasizing the need for economy and conservation in every direction. From the standpoint of coal saving, however, the restrictions imposed on electric signs is a negligible factor. From carefully compiled statistics, the National Committee on Gas and Electric Service reports that if all the electric signs in the country were discontinued the saving in coal would amount to not over one-tenth of one per cent. The utility companies are, however, gladly complying with this war measure.

The regulations of sign lighting can be easily controlled by the Federal Government, because of the close co-operation possible by the utility companies. But it will be most unfortunate indeed if the source of the greatest waste of coal—and which accomplishes no good purpose, as does sign lighting—is to continue unabated. There are thousands of steam and steam-electric generating stations of antiquated and inefficient design throughout the country that are being operated carelessly and ignorantly and thereby wasting large quantities of coal needlessly. And these plants are not only wasting coal, but are belching forth large volumes of cinders and smoke and fumes to cause damage and expense to property and vegetation, endanger public health and plunge our cities into smoke fogs. This is to continue, seemingly.

The conservation of coal is vital, for fuel and food will win the war it is claimed. The conservation of coal by mining it more carefully and completely is important. But vastly more important is the conservation that comes of more scientific application and more efficient utilization because coal in the ground is coal only, whereas coal at the point of consumption is fuel plus labor and transportation costs and complications, and thus is of far higher intrinsic worth. Every available heat unit should be used now on the score of economy, on the score of conservation and to reduce the congestion of the railroads and lighten their burden as much as possible. Yet according to a recent government report of the 100 per cent of the heat in the coal fired 43 per cent is lost in the boiler room. The modern progressive company employs skilled workers in its factory, trained buyers, capable accountants, progressive executives, and efficiency engineers to cut costs and speed up production while improving the quality. Efficiency of production, economy of performance are the keynotes in every department, but with almost invariably one exception—the boiler room. In the boiler room the executives and efficiency engineers rarely go, probably because it is usually dirty and dark and odorous, and because they do not realize the extravagance or the economies of which it is capable. It is in the boiler room that coal, now at a price comparable with sugar, and always one of the chief items in operating expenses, is at the mercy of men who frequently know little about what they are doing because they are ignorant or have no equipment to tell them what they are accomplishing, or do not care. As often as not supervision is lacking, or at best is very superficial. If steam-making were the aim sought and not the means to an end conditions would of course be very different.

The remedy lies in educating those responsible for the plants as to how best operate them and insist that they employ the means and apparatus for doing it. In the past abundant cheap fuel at relatively low cost offered little incentive for efficient utilization except to the largest boiler-rooms where labor, transportation and other factors in addition to the actual cost of the coal enter into consideration. But today conditions are changed. Coal is now comparable with the price of sugar; the cost of transporting it has risen; the demand exceeds the supply. Upon it the personal comfort, nay health, of millions depend; the existence of communities, the prosperity of industry and the life of the whole nations are dependent.

Of the 150,000,000 tons of coal needlessly wasted annually, 65 per cent is handled by 250,000 firemen in power houses, and but 20 per cent by the millions for domestic purposes. It is to the multitudes of power houses and railroads scattered over the country that the Nation must look therefore to conserve its coal, if conservation is to gain practical value. Those plants so situated that they can purchase energy efficiently made instead of with gross extravagance, an extravagance that appears almost criminal under circumstances as they exist today, should be compelled to do so. Those plants that must continue to operate should be regulated and their performance controlled by Federal, State or civic authorities, that the Nation's coal supply be not needlessly and wantonly impoverished. Civic departments for boiler inspection and smoke abatement and allied insurance interests should immediately co-operate with Federal or State authorities to improve those plants where feasible without radical changes.

Week's Events

Progress of Contractors' Reorganization—Ohio Association Discusses Underground Distribution—Commission Increases Fares in Test Case—Recomendations for Coal Conservation

REORGANIZATION OF CONTRACTORS' ASSOCIATION PROGRESSES RAPIDLY.

Seven States Have Adopted New Constitution—Complete Reorganization Expected by January 1.

As was predicted at the recent annual convention of the Electrical Contractors' Association at New Orleans, the various state organizations are rapidly organizing and endorsing the new plan of organization.

In practically every case adoption of the new constitution was effected in open meeting at which W. L. Goodwin was invited to explain the details of his plan. The states which have adopted the new constituton and the dates on which this action was taken, are as follows: Alabama, October 17; Louisiana, October 18; Minnesota, October 22; New Jersey, October 27; Connecticut, November 7; Michigan, November 9; Ohio, November 14.

Secretary Harry C. Brown reports that from present indications the association will be operating under the new schedule before the first of the year, there being several states that will hold meetings early in December and it is only necessary to have 14 states endorse the new constitution in order to hold a meeting of the new executive committee. Col. Robley S. Stearnes, president of the association, also feels assured that the reorganization will be completed in record time, and he reports much enthusiasm being shown and confidence in the future of the organization.

Earnest McCleary,of Detroit, Chairman of the Central Division, announces that a sufficient number of states under his jurisdiction have qualified under the new constitution to warrant calling a meeting for the completion of the organization of the Central Division. This meeting will be held at the Hotel La Salle, Chicago, at 10 a. m., December 10.

VALUABLE SALES HELPS FOR ELECTRICAL CHRISTMAS CAMPAIGN.

Concrete Suggestions Embodied in New Booklet of Society for Electrical Development.

The Christmas campaign edition of Monthly Sales Service has just been issued by the Society for Electrical Development, featuring the sales plans and special advertising for America's Electrical Christmas. The book tells how the electrical industry is going to get its rightful share of the $200,000,000, which it is estimated will be spent for gifts this Christmas.

The book is directed to the central station and what it should do as the leading electrical factor in the community, with ten practical suggestions; to the electric shop, with fifteen plans besides a number of profitable sales ideas; to the salesman in the store and on the road, with more practical hints, and to the wiring contractor, telling why the little side-street man and the big main-street shop should take this real opportunity to become a full-fledged dealer.

The book contains 48 pages and cover, a large portion of which is devoted to attractive advertisements for newspapers, all ready to clip out and use as copy.

The motion-picture idea is fully explained, by which motion-picture films exploiting the use of electrical devices are made available to all at the small sum of $15 each.

Altogether, the plan as finally focused in this complete book is one of the most comprehensive that has been carried out along merchandising lines in the industry.

UNDERGROUND DISTRIBUTION AT AKRON, O.

Details Discussed at Transmission and Distribution Meeting of the Ohio Electric Light Association.

Underground distribution was the topic of the day at the first open meeting of the Transmission and Distribution Committee of the Ohio Electric Light Association at Cleveland, Ohio, November 22, 1917.

A paper on the design and construction of underground distribution systems was read by W. E. Salber of the Northern Ohio Traction & Light Company, Akron, Ohio.

A careful treatment of the subject was given which related to the Akron system. The standard size manhole adopted was 8 feet by 7 feet 6 inches by 6 feet 8 inches deep. All the manholes were constructed of concrete, which seemed to answer the particular demands of the local soil conditions. Further, the labor conditions seem to point to the advisability of using concrete in preference to brick, owing to the fact that the laying of brick requires skilled labor. All concrete manholes were constructed by means of sectional collapsible form which has materially reduced the labor connected with the construction of a manhole. The method of bringing the ducts into the manhole was described as follows:

The fiber ducts were laid on a pad of concrete and separated one from another by 1 to 1.5-inch concrete and then covered with a 3-inch pad; in other words, a solid mass of ducts and concrete was had. The ducts as they approached the manhole were fanned out into a funnel shape. This form of construction, that of entirely imbedding the ducts in concrete, introduced a very desirable factor, that of making it possible to lower the complete duct system should it be necessary because of street improvement. A section of 50 to 100 feet has been lowered in this manner.

Fireproofing of cable was carried out by means of metal lath with meshes partially filled with clay and the whole mass covered with cement.

Satisfaction was expressed with the carrying of the underground system right to the customers' transformer vault, which could be located at the center of the load and in this way reduce the voltage drop and losses.

Transformers as banked throughout the system were loaded to a total capacity of the bank of 300 kilovolt-amperes. The secondaries between the banks were fused at a point which would prevent either transformer being required to do the duty of both transformers in the bank.

Street-lighting systems were installed with the use of park cable.

The discussion which followed was led by F. M. Hibbin, Cleveland Electric Illuminating Company, Cleveland, Ohio, who explained about the effect of soil on the operation of cables. Sandy soil is more or less detrimental in that the moisture when once baked out is hard to replace; further, it has been proven that the paving of streets prevents moisture seeping into the soil.

Mr. Wenzel of the Northern Ohio Traction & Light Company and Mr. Raikstraw of the Cleveland Electric Illuminating Company discussed the relative merits of fireproofing of cables by introducing the metal-lath construction or a more simple and economical method of fireproofing, which consisted of cheese cloth filled with cement, that is, about one-inch layer of cement placed between cheese cloth and the lead sheath. This type of fireproofing made it possible to carry up this protection very close to the entrance and is as a whole more easily applied.

Considerable discussion was raised on the point of the size of fiber advisable to use in an underground system. It seems that the popular size heretofore used was the 3-inch fiber but at the present time with the demand for greater loads and therefore larger cables, the 3.5-inch duct seemed to be the most practicable size to use.

The relative value of sector cable was discussed and seemed to show that the use up to the present time has not been sufficient to prove its true worth.

The discussions were entered into by all in attendance and brought out some very interesting and valuable information pertaining to the underground systems.

The entertainment of the day was in the form of a film describing the manufacture of Mazda Lamps as made and presented by the National Lamps Works. This film was exceptionally instructive and enjoyable to all.

PATENT OFFICE ENDORSES HISTORICAL INSTITUTE.

Resolutions Offered Pointing Our Advantages of National Capital as Ideal Location.

Resolutions have recently been passed by the Executive Committee of the Patent Office Society, relating to a proposed Institute for the History of Science, for which a Washington location is advocated. The resolutions are as follows:

That the attention of all interested in the possibilities of the proposed Institute for the History of Science be called to the advantages of such a location and organization for that Institute, whenever it shall be established, as shall render its resources easily available not only to highly trained specialists, but also to practicing engineers, to examiners of patents, and, so far as practicable, to the general public.

That, in the judgment of the Patent Office Society, the present moment of prominence of American ideals and of recognized dependence upon the facts and principles of science is none too early for preliminary steps toward the establishment in this country of an Institute of the general character already proposed (by George Sarton, and others, in *Science*, March 23, 1917), such Institute to be independent, liberally endowed, and adequate not only to the requirements of our present national life but also to that great era of internationalism and general enlightenment upon which even the avoidance of war may hereafter depend.

That the special committee having in hand relations with the National Research Council be directed to emphasize to that body the foregoing conclusions as perhaps pertinent to purposes shared by it; to solicit the concurrence therein of both the local and the national scientific and engineering societies, and to publish the same generally, or in its discretion, always with careful regard to the aims of those to whom the project is due.

NEW YORK COMMISSION INCREASES FARES IN TEST CASE.

Rules That Conditions Entitle Company to Increase Regardless of Franchise Restrictions or State Law.

The Public Service Commission for the Second District handed down a decision November 20, 1917, in the case of the Huntington Railroad Company, a street railroad running between Huntington Harbor and Amityville on Long Island, N. Y. It was one of the numerous 6-cent fare cases, so called. By reason of the fact that it presented clearly two questions, one of which is common to nearly all of the street-railroad applications and the other to a very large number of them, all the street-railroad corporations and all the cities, towns, villages and other municipalities interested adversely were notified of the hearing, and so far as they desired were heard upon all of the legal questions involved. There was no dispute that the Huntington Railroad Company required increased revenue in order to enable it to pay its operating expenses. No community through which it runs either by its board or council objected to the applicant's case on the facts, nor did any of the inhabitants thereof or any of the patrons of the road. The only points at issue were:

(1) Whether section 181 of the railroad law, which limits a fare for a continuous ride within any city or village to 5 cents, precludes the Commission from authorizing a 6-cent fare.

(2) Whether the acceptance by a street-railroad corporation of a franchise containing a 5-cent fare condition precludes the Commission from increasing such fare from 5 to 6 or more cents for one continuous ride in the same city or municipality.

The Commission has decided that the public service commissions law was intended by the Legislature to vest power in the Commission, and has made it the duty of the Commission, where it finds upon a sufficient showing that in fact the maximum rates or fares chargeable either under section 181 of the railroad law or under the local franchise are insufficient to yield reasonable compensation for the service rendered, and are for that reason unjust and unreasonable, to authorize the increase of such fares.

The principal opinion is by Commissioner Carr, who cites all of the decisions and all of the statutes

of the state of New York having any bearing, historical or otherwise, upon the question. There are concurring opinions by each of the other commissioners.

A summary statement of the decision is that the Commission has followed the Court of Appeals in the Ulster & Delaware case (218 N. Y. 643) and the Appellate Division for the Third Department in the New York & North Shore case (175 App. Div. 869). After authorizing the advance of the Huntington Company's fares from 5 to 6 cents, the Commission's order concludes: "This determination and order may be reopened at any time if and when it may appear to the Commission that the controlling reasons for allowing an increase of fares in excess of those which otherwise would legally obtain no longer exist."

RECOMMENDATIONS OF IMMEDIATE APPLICABILITY FOR CONSERVATION IN USE OF COAL.

Strong Appeal to Owners and Managers of Power Plants by Chamber of Commerce of the United States.

A timely and urgent appeal has been made to the owners and managers of power plants throughout the country by the special Committee on Coal Conservation of the Chamber of Commerce of the United States. This is a strong and representative committee, as shown by its personnel as follows:

Ernest T. Trigg (chairman), president of Philadelphia Chamber of Commerce, vice-president of John Lucas & Company, paint manufacturers; Lester P. Breckenridge, professor of mechanical engineering, Sheffield Scientific School, Yale University, New Haven, Conn.; Thomas E. Donnelley, president, R. R. Donnelley & Sons Company, printers, Chicago; P. H. Gadsden, president, Consolidated Railway & Lighting Company, Charleston, S. C.; Ira N. Hollis, president of Worcester Polytechnic Institute, Worcester, Mass., president of American Society of Mechanical Engineers, and chairman of the Engineering Council; Frank H. Johnston, president, City Coal & Wood Company, New Britain, Conn.; John S. Lawrence, textile manufacturer, Boston, Mass.; John W. Lieb, vice-president, New York Edison Company, and president of National Electric Light Association; John F. McGee, member of Minnesota Commission of Public Safety, Minneapolis; Charles E. Wales, retired coal operator and distributor, Minneapolis, Minn.

The committee's statement is as follows:

Costs of production have more attention today than ever before. The costs of coal for generation of power have in many instances not had the same consideration as other costs, because coal has been cheap and obtainable in abundance; cheap coal and cheap labor sometimes made it apparently economical in dollars and cents to install and run an inefficient plant.

Coal has now become expensive. It is hard to obtain. Efficiency in its use and avoidance of waste have become of first importance, since without power other materials cannot be utilized.

These conditions make it imperative for every owner or manager of a power plant to examine into the cost of the power his establishment uses, the economy with which it is generated and applied, and the increase in efficiency that is possible. Some of the steps that an owner or manager should take are:

SPECIAL RECOMMENDATIONS.

(1) Reconsider the advantage of buying heat and power from a specialized plant that makes nothing else and can afford the investment and supervision that gets a maximum of value out of each pound of coal; in some localities hydroelectric power may be available.

(2) Find the nearest source of coal that will meet the requirements, even if it does take a little more trouble to use it. The tax on the transportation system will thus be reduced so far as haulage by rail is shortened. Coal is mined in 26 states, and these states extend practically across the continent and from the northern to the southern borders.

(3) Give to the power plant and its personnel recognition and encouragement such as is due an expert and important department, thus getting new effort and attention to offset the extra attention and care needed with coal inferior in grade and preparation to the coal formerly available.

(4) Seek to increase skill and proficiency in the men who handle the coal. A fireman at a hand-fired boiler shovels three to ten tons of coal a day—or as great in value in material as many skilled men in other departments.

(5) Put the fuel-using equipment into as perfect condition as possible; provide at hand-fired plants an ample firing floor with a good surface, together with a smooth-bottomed coal car if it can be used; eliminate leaks in the boiler setting, see that firedoors fit properly, replace defective grate bars, make sure that smoke connections are clean and tight; if mechanical stokers are used, see that they are in good repair and that directions for using them are being followed; in general, make the plant and the fireroom of such character that an efficient man will stay on the job.

(6) Install simple and convenient means by which the fireroom force may see results. Scales for weighing fuel and ash, meters for measuring water fed to the boiler, and devices for determining the quality of flue gases, the draft over the fire, etc., can be made to interest the men in the fireroom and show the actual results of efforts to economize. Convenient means for operating the flue damper must be installed.

(7) Endeavor to run boilers in service at their capacity. If efficiency is increased, one or more boilers in a battery may be dropped.

(8) Provide water that is free from scale by using, when necessary, water-treating devices if the plant is large, and special feed-water heaters in small plants.

(9) Reduce loss of heat after it is generated. See that boiler surfaces and steam pipes are properly covered; the simplest and most inexpensive covering will reduce loss by 80 per cent. In the engine room cut out useless steam lines, have valves properly set, reduce the small auxiliary pumps, etc., to a minimum, provide the repairs the engineer has been asking.

(10) Obtain expert advice. Good steam engineers are familiar with well-tried ways of reducing both consumption of coal and consumption of heat. Their advice should be obtained in all practical cases. This is not a time for radical innovations but for utilizing tried experience.

One pound of coal per hour has yielded a horsepower per hour. That is the record of present possibility. It cannot by any manner of means be attained by every plant. But the fact that at present the average attainment throughout the country is but one-third or one-fourth of this record is indicative of the possible savings that can be made if the care and attention which the power plant deserves are actually given to it.

The suggestions which have been given above are typical of the points about which every owner and manager of a power plant should assure himself. The applicability of any general suggestions will vary with nearly every plant.

Most users of coal can join in promoting efficiency of coal. Railways have made real progress in firing locomotives; they can often go farther. Gas works can generally effect further saving by using careful technical direction. Manufacturing plants of every degree can show great results in the aggregate.

The Bureau of Mines on behalf of the Federal Government has gathered a great deal of information about the use of coal and has expert advice to give regarding means of economy. Some of the publications in which the Bureau of Mines has embodied the results of its experiments and made practical suggestions based upon expert observations and conclusions of its staff and other engineers are indicated in the attached list. In many instances state agencies, too, have data and suggestions which are to be had for the asking.

SOME PUBLICATIONS OF THE BUREAU OF MINES ON THE USE OF COAL.

"Combustion in the Fuel Bed of Hand-Fired Furnaces." Technical Paper No. 137. Price 15 cents.

"Hand-Firing Soft Coal Under Power-Plant Boilers." Technical Paper No. 80.

"Factors Governing the Combustion of Coal in Boiler Furnaces." Technical Paper No. 63. Price 5 cents.

"Experiments With Furnaces Having Hand-Fired Return Tubular Boilers." Technical Paper No. 34.

"Economic Methods of Utilizing Western Lignites." Bulletin No. 89.

"The Smokeless Combustion of Coal in Boiler Furnaces." Bulletin No. 40. Price 20 cents.

"City Smoke Ordinances and Smoke Abatement." Bulletin No. 49.

"Deterioration and Spontaneous Heating of Coal in Storage." Technical Paper No. 16.

"The Deterioration of Stored Coal." Bulletin 136.

"Operating Details of Gas Producers." Bulletin 109. Price 10 cents.

"Directions for Sampling Coal for Shipment or Delivery." Technical Paper No. 133.

"Graphic Studies of Ultimate Analysis of Coals." Technical Paper No. 93. Price 10 cents.

"Saving Fuel in Heating a House." Technical Paper No. 97.

ENGINEERING DATA NECESSARY FOR AN ELECTRIC RATE DETERMINATION.

Paper Presented by B. H. Peck Before Joint Meeting of Electrical Engineers in Chicago.

Numerous other factors entering the determination of the system of electric rates, aside from valuation, were pointed out in a paper entitled "Engineering Data Necessary for the Electric Rate Determination," presented by Bert H. Peck, electrical engineer of the Illinois State Public Utilities Commission, before a joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, held on the evening of November 26. Mr. Peck showed that while valuation is an extremely important factor in any rate case, it is really only one element of the problem. Among other important factors are thorough consideration of operating expense, general character of the utility, local conditions, prevailing features affecting the accruing depreciation, etc. Mr. Peck reviewed the methods employed by the engineering staff of the Illinois Commission, which prepares three careful engineering estimates of the utility's valuation. The first is an original-cost estimate of plant and equipment, prepared from all the data available on the actual costs and other facts that throw light on this matter. The second is a reproduction-cost estimate, the third is a normal-reproduction-cost estimate. Each of these three estimates is subject to careful consideration of depreciation, not only as to the useful physical life of the equipment, but also as to its conditions of service, the character of load and its likelihood of developing, and other factors affecting the probable practical useful life. Then a very careful engineering estimate is made of the normal operating expenses. This requires a thorough analysis of the conditions of service, character of equipment, etc. With the estimates of value and of operating expenses prepared, the fundamental engineering bases for determining the revenue requird are obtained. The remainder of the problem is the determination of the character of rates best suited for the particular utility and how these rates should be levied. The engineering staff makes a thorough analysis of the consumption of the various classes of customers to determine the effect of different kinds of rates on these classes of service. A seemingly elaborate, but well systematized, method of making this analysis was described. Mr. Peck referred to numerous other elements that must be considered, such as efficiency of the distribution system, accuracy of meter readings, improvements in operating methods, etc.

This subject was discussed by A. C. King, E. J. Fowler, W. A. Shaw, J. G. Wray, R. F. Schuchardt, J. H. Prior, K. B. Miller and Mr. Peck. Mr. Shaw, who is a member of the Illinois Commission, stated that aside from the engineering facts brought before the Commission by its engineering staff, the Commission must actually consider a great many other matters, such as the suggestions of legal and other experts. It is a fact that many of the features referred to by Mr. Peck were adopted on ideas presented before the Commission by experts testifying in various cases. He also spoke approvingly of the present valuation being made of all the properties of interstate common carriers by the Interstate Commerce Commission. Some speakers had referred to this as being an extravagant procedure at the present time. He also called attention to the desirability of making a practical inventory and not an actual count of every trivial item; good common sense is necessary in making estimates of the details. Mr. Miller agreed as to the importance of using common sense in making inventories and said that the fine-tooth-comb method of making an appraisal leads to more errors than anything else. This attention to detail, however, was caused by the need for most elaborate preparation to meet the rigid cross examination to which utility and commission engineers are subjected to by lawyers in hearings of rate cases. Mr. Schuchardt stated that real brains are needed in utility regulation, as it had been evident from the disclosures in Mr. Peck's paper. He referred to the conference being held in Chicago by the Public Ownership League, in which it had been stated that utility regulation had failed and therefore public ownership must next be taken up. This is by no means true, however, and the only cases where utility regulation has failed were those where it had been tampered with by politics.

WATER-POWER DEVELOPMENT SEEN AS WAR NEED.

President's War Message to Congress to Urge Suitable Legislation.

Water-power development, to save vast quantities of coal, will go before Congress as one of the chief recommendations in President Wilson's second war message. Secretaries Lane, Baker and Houston have nearly reached an agreement on the proposed legislation.

Enough energy to run all the nation's industries, railroads and mines is still locked up due to differences between private interests and conservationists on the proper terms of development. Government experts estimate that enough of this could be put into use within a year to replace between 20 and 25 per cent of all coal now used.

Private interests are urging haste in the matter.

The Government's plan is understood to be a system of leasing. No public lands will be given into private hands. The power sites will be leased to private concerns for operation for 50 years, rates of the electricity produced to be regulated by the Government.

CLOSE WATCH ON GERMAN TRADE PREPARATIONS.

Department of Commerce Aiding Manufacturers Prepare for After-War Foreign Business.

German preparations for trade after the war are being scrutinized carefully by experts in the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, and the recent important report on the subject of "German Foreign-Trade Organization" by Chauncey D. Snow, which touched on this point, has been in such great demand as to establish a new sales record for Government trade reports.

Since the war eliminated Germany from world trade, the United States has improved its position in foreign markets in spite of the shipping shortage and other abnormal restrictive factors. Department officials point out that the future prosperity of the country will depend in part on Germany's loss of good-will in practically all foreign markets and in part upon American ability to maintain our new prestige. American business must not make the mistake of seeing only one side of this situation and thus underestimatng the German capacty for foreign trade nor the energy, application and craft with which German business will address itself to the task of regaining favor in markets in which it once prospered.

In order to understand the significance of the information on German trade moves that will from time to time be made public, Secretary Redfield counsels not imitation of, but familiarity with the German theories of foreign trade and the artful and formidable organization that with government aid at every turn has been built up in Germany during the last 20 years to dominate the world's markets. It was to meet the demand for such information that the Bureau of Foreign and Domestic Commerce issued the bulletin on "German Foreign Trade Organization." The unprecedented demand for it is taken as an indication that the American manufacturer is making after-war preparations of his own.

The Bureau now plans to get out a supplementary bulletin on German trade and preparations for the commercial future about the first of the year and further supplements as rapidly as important additional information is received.

H. T. DYETT JOINS INDUSTRY CONFERENCE.

Succeeds J. C. Bridgman on Conference for Rubber-Covered Wire for Underwriters' Laboratories.

H. T. Dyett, president of the Rome Wire Company, of Rome, N. Y., has accepted the appointment as a member of the Underwriters' Laboratories Industry Conference for rubber-covered wires and cords. Mr. Dyett was nominated as one of the three manufacturers' representatives on the Conference at a recent meeting of the Wire and Cable Section of the Associated Manufacturers of Electrical Supplies. He succeeds the late John C. Bridgman, of the Hazard Manufacturing Company. The other manufacturers' representatives are Leroy Clark, president of the Safety Insulated Wire Company, and Everett Morss, president of the Simplex Wire & Cable Company.

These manufacturers' representatives serve with three members of the Underwriters' Laboratories and establish all rules governing factory testing and the establishment of manufacturing standards insofar as the label service of the Underwriters' Laboratories is concerned. There is an Industry Conference for virtually each branch of the electrical industry manufacturing a product entitled to label service, these branches virtually corresponding to the various sections of the Associated Manufacturers of Electrical Supplies.

The personnel of these Industry Conferences comprises three manufacturers, in each instance nominated by the Associated Manufacturers and three members of the staff of the Underwriters' Laboratories.

This practice of giving manufacturers a voice in the establishment of testing standards has been in effect for a number of years and has entirely eliminated many controversies which arose previous to the adoption of this plan. A. R. Small, vice-president of the Underwriters' Laboratories, in commenting on the conference idea stated that it was the opinion of the Laboratories that the manufacturers were best able to prescribe standards which must be met in their products and to advise the Laboratories of changes in standards that must be made from time to time to keep abreast of changes and developments in the industry. These industry conferences also have the power of determining the cost of label service and as elected delegates have authority to speak for all of the manufacturers in their class.

ARTHUR WILLIAMS HAS WORDS OF ENCOURAGEMENT.

Tells of Work as Food Administrator and Pays Compliment to Electrical Industry for Its Patriotism.

"It is a matter of distinct gratification to me, personally, and I think to every one in our industry, to see so many of its most prominent men giving their time and best thought to the interests of the Government. I have in mind such men as J. W. Lieb, Jr., N. F. Brady, who is at the firing line in Italy on Red Cross work, Major Peter Junkersfeld and others. And I would speak also of another class of men whose

work is not so much heard of, but which is of exceeding importance, a class of which C. L. Edgar, Theodore N. Vail and Col. J. J. Carty are typical examples. They are ready to go to Washington at a moment's notice to confer with government officials upon any and all matters where their experience will aid in promoting war efficiency. It is a great pleasure to me to have been asked to include my services along with theirs."

Thus Arthur Williams, general commercial manager of the New York Edison Company, and in his new capacity Federal Food Administrator of the city of New York, expressed himself to a representative of the ELECTRICAL REVIEW.

In speaking of his new work, Mr. Williams said that while it had no relation to the electrical industry, it was being carried on by the same systematic and efficient methods that characterize the operations of that great industry. He further said: "The food conservation movement is new to us. We are a nation of food wasters. The great vision of the necessity of food regulation and the elimination of food speculation seems to have been with our President.

"In Herbert C. Hoover we have the one man who could so quickly concentrate public thought upon the necessity of saving. Mr. Hoover, in his processes of thought, in his broad grasp and in his surprising knowledge of detailed acquaintance with every phase of his subject, reminds me of no one so much as Thomas A. Edison. Also he possesses the power of picking men, and he has surrounded himself at Washington with an uncommonly efficient organization of which he is the constructive leader."

According to Mr. Williams, the problem is twofold, at least. First the stimulation of production, including the elimination of hoarding and speculation. Second, the elimination of waste as far as it can be done. He asserts that New York garbage-pail waste has already been reduced 10 per cent. Also the use of wheat in that city has been reduced 20 per cent in the last few weeks. These are concrete results and point the way to what may be expected when the food conservation movement is in full swing everywhere.

The most pleasant part of his work, Mr. Williams says, is to note and feel the spirit of co-operation on every hand. The Hoover food plan, when once understood, receives no opposition. This is in part due to the fair spirit in which it has been proposed, acknowledging as it does the right of fair profit on the part of the farmer, producer and the distributer, who performs an important service.

Oregon Association of Electrical Contractors and Dealers Adopt New Constitution.

In following out the action taken by the National Association of Electrical Contractors and Dealers at New Orleans October 11, 1917, the Oregon State Association of Electrical Contractors and Dealers held a special meeting at Multnomah Hotel, Portland, Ore., November 17, 1917. The meeting was called by J. L. Tomlinson by virtue of the authority vested in him by appointment by Robley S. Stearns, president of the National Association. The meeting was called to order by Mr. Tomlinson and S. C. Jagger was called upon to preside. Resolutions were unanimously adopted changing the constitution and by-laws of the Association to conform with that of the national body. Action was also taken to have the meetings, activities, etc., conform to the new constitution.

ACTIVITIES IN THE POWER-GENERATION FIELD.

Orders of Two Large Manufacturing Companies Indicate Large Amount of New Construction Work.

In spite of unsettled conditions, much new construction work of importance is under way at the present time, or has been completed very recently. Two large manufacturers of power-plant equipment, in discussing the subject with a representative of the ELECTRICAL REVIEW, gave figures that are of interest at a time when there is so much talk of such enterprises being practically at a standstill. The manufacturers referred to are the I. P. Morris Company, of Philadelphia, manufacturer of hydraulic turbines, and the American Engineering Company, of Philadelphia, which makes the well-known Taylor stoker.

Lewis F. Moody for the I. P. Morris Company reports the following installations completed during this year or now under construction.

Purchaser.	Units.	Head.	R.P.M.	H.P.	Total H.P.	Date of completion.
Utah Power & Lt. Co. (Oneida)	1	140′	180	15000	15000	*
Rochester Ry. & Lt. Co.	2	130′	180	16000	32000	1917
Utah Power & Light Co. (Cove)	1	90′	171.5	10500	10500	1917
Mattagami Pulp & Paper Co.	2	45′	112.5	4500	9000	1917
Keith Paper Co.	1	38′	225	1110	1110	*
Canadian Copper Co.	1	85′	150	7500	7500	1917
Western Carolina Power Co.	2	115′	171.5	13200	26400	*
Abitibi Power & Paper Co.	4	55′	128.5	6000	24000	*
Utah Power & Light Co. (Grace)	1	482′	514	16500	165000	*
Turners Falls Power & Electric Co.	1	54′	97.3	9700	9700	*
Utah Power & Light Co. (Olmsted)	1	538′	514	7700	7700	*
Turners Falls Power & Electric Co., No. 6	1	54′	97.3	9700	9700	*
Riordan Pulp & Paper Co.	1	200′	450	3600	3600	*
Idaho Power Co. (Swan Falls)	2	21′	90	1750	3500	*
Utah Power & Light Co. (Cutler Dev.)	2	125′	180	14000	28000	*
Western New York Utilities Co., Inc.	1	83′	300	2800	2800	*
Total of above					355,510 H.P.	

*Under construction.

In the case of the American Engineering Company, M. Alpern, sales manager, gives the following figures on work now under way or recently completed.

Purchaser.	No. stokers.	No. retorts.
Acme Power Co., Toledo (new)	4	15
	4	16
Detroit Edison Co. (additions)	4	9
	6	7
Brooklyn Edison Co. (additions)	10	7
	12	5
Erie Lighting Co. (new)	12	7
Narragansett Elec. Lighting Co. (additions)	8	7
Philadelphia Suburban Gas & Elec. Co. (addit.)	4	8
	2	11
Public Service Corp. of N. J. (additions)	4	15
	8	7
Philadelphia Electric Co.—		
Additions	2	15
New Beacon Street	8	15
Planned	8	15
Toledo Railway & Light Co. (additions)	6	6
Rockingham County Light & Power Co. (addit.)	2	7
Penn Central Transit & Light Co. (additions)	4	9
St. Joseph (Mo.) Railway & Lt. Co. (additions)	2	7
Fort Worth (Tex.) Power & Lt. Co. additions)	1	7
Meridian (Miss.) Lt. & Railroad Co. (additions)	1	8
West Va. Traction & Electric Co. (additions)	4	3
Federal Lt. & Trac. Co., Wellensburg, Colo. (additions)	2	5
Rockland Light & Power Co. (additions)	4	6
Iowa Railway & Light Co. (additions)	1	7
Moline & Rock Island Mfg. Co. (new)	1	6
	3	11
Consolidated Gas, Electric Light & Power Co., Baltimore (additions)	6	8
	2	11
Haverhill (Mass.) Electric Co. (additions)	1	7
Republic Railway & Light Co.—		
New	12	14
Additions	6	7
Alabama Power Co. (additions)	1	12
Dayton Power & Light Co. (new)	6	14

Commercial

Economy of Electric Furnace Shown—Chicago Electric Shop Sells Non-Electrical Goods—Other Sales Suggestions

ELECTRIC FURNACE INSTALLED AT KALAMAZOO FACTORY.

Operating Results Indicate Many Economies—Central-Station Service Employed.

The Harrow Spring Company, Kalamazoo, Mich., is a large user of electric power, supplied by the Consumers Power Company. The current now required amounts to 550,000 kilowatt-hours per month, and this will be considerably increased as soon as certain new equipment is ready for service. In this expanding business there are 75 direct-current motors in use, of a combined capacity of 650 horsepower; and in addition to this, a constant-speed, induction motor of 1000 horsepower is being put in position to operate a new 22-inch rolling mill which is being installed. The energy is delivered to the plant at 5000 volts, and transformed down to 440 volts for motors and cranes.

The most interesting feature of these works is the six-ton electric furnace, of the capacity of approximately 60 tons per day. The products consist of a low-carbon nickel steel, a plain carbon steel, manganese steel and chrome steel. The furnace uses three-phase current at 105 volts, and consumes 600 kilowatt-hours per ton for nickel steel and about 550 kilowatt-hours per ton for smelting the plain carbon steel. It produces an average of 6.7 tons per heat of low-carbon nickel steel, amounting to about 25½ tons in 24 hours; and about 6.8 tons per heat of plain carbon steel per heat. The different charges are made up of heavy drop forgings, turnings, plate and punchings. A preliminary test precedes the tapping of each heat, which test requires about 20 minutes. The furnace lining consists of silica brick, with a magnesite bottom. In reference to the life of the lining, it is understood the lining proper is good for an average of 150 heats, and the roof for an average of 136 heats; the best run of a set of linings is reported at 174 heats and the roof at 155. The furnace is equipped with facilities for tilting electrically into the ladle that handles a full furnace charge. The ladle, with its one-heat load of molten metal is lifted and conveyed to the molding department by a 15-ton electric crane.

The company has completed the installation of a new type of oil-burning furnace, as a pre-heater, to supply hot metal for the electric furnace.

Among the applications of electric power to plant equipment are four shears, each operated by an individual motor; a centrifugal fan, driven by a 50-horsepower motor, to supply draft for eight oil-burning, re-heating furnaces. In the machine shop a number of shop tools are operated by group drives from a 40-horsepower motor. In the large shop devoted to the manufacture of steel springs, the controls for the oil-furnace equipment are electrical. A Sullivan air compressor is operated by a 75-horsepower motor at a speed of 865 revolutions; and a cold-steel saw is driven by two motors of 75 and 20-horsepower, respectively. In this shop, there are, also, two long line-shafts driven by 40-horsepower motors, for operating machine tools by belt transmission; and two more motors of 40-horsepower each for a drop hammer punch and other equipment.

Emphasizing the Economy and Utility of Electrical Appliances.

With the approach of the Christmas season and the desire on the part of central stations and dealers to promote the sale of electrical gifts, there is considerable need to emphasize the utility of electrical appliances from both the standpoint of economy of operation and lightening of labor in the home.

The accompanying reproduction of a recent advertisement of the Commonwealth Edison Company, Chicago, brings out in a striking way these two features of economy and utility. The company is conducting a campaign for the sale of electric-washing machines and as an incentive to prospective purchasers, is making a discount of $5. The balance is payable in monthly installments.

"If I only had a Federal."
The Big IF in Life
WHY "if" your way through weary washdays? Your weekly washing costs about one cent for electricity when you use a Federal Electric Washing Machine, and all the hard work of washday—even the wringing—is done by electricity quickly, economically, and without fuss or muss.
Let Electricity Lighten the Labor of the Home
Our Washing Machine Campaign is now on. Telephone Randolph 1280—ask for Local 214, 215, or 216 and our representative will call at your home and explain our liberal low cost offer
$5 as a first payment brings a Federal Electric Washing Machine to your home, if you are a customer of this Company. Balance payable a little each month with your electric light bills. Demonstrated and sold at our Electric Shops and Branch Stores
CLIP THIS OUT
GOOD FOR $5
Commonwealth Edison Company
Heating and Appliance Division
Contract Department
EDISON BUILDING
72 WEST ADAMS STREET
CHICAGO

Advertisement of Commonwealth Edison Company Used in Washing-Machine Campaign.

Chicago Company's Electric Shop Annex Handles Non-Electrical Goods.

The annex recently added to the Commonwealth Edison Company's Electric Shop marks an epoch in merchandising by the central-station company, in meeting new needs and fulfilling wider demands as well as making additional floor space available. There is a growing demand for articles non-electrical by passing shoppers, and customers who are purchasing or have purchased electrical articles. It is frequently found that those buying portable lamps, desk lamps and similar articles also want ink stands, letter pads, blotters, trays and similar things, useful as well as ornamental that harmonize with the shade and color or setting of the lamp. To meet this demand the Annex is adapted to exhibit numerous non-electrical articles such as Dutch chinaware, Oriental vases, Indian pottery, cut glass, pencils and trays of artistic and unique design from a large assortment of which a client can choose those that make the most artistic color scheme, with the lamps or other appliances purchased, with a minimum of delay and exertion.

The presence of these non-electrical articles adds to the picturesqueness of the Electric Shop, at the same time accommodating customers. Their presence widens the scope of the Electric Shop and increases the number of sales, likewise the number of visitors, thus improving the load-factor of the Shop. Moreover the wide variety of articles on exhibit attracts prospective customers that otherwise might not be attracted were the articles on exhibit purely electrical, and thus they are subjected to the seductive influences of the labor saving artistic electrical goods that surround them, that hint of usefulness, of seasonal gifts and purchase.

In addition to the sale of non-electrical goods, the articles of lower price that might tend to become dwarfed in the main body of the Electric Shop when placed beside the many costly and extravagantly beautiful creations have now been moved to the Annex. Here they are no longer overshadowed, and because removed from the almost bewildering grandeur of the main section of the Electric Shop show up to better advantage and at their true worth, making choice easier. Automobile supplies, electrical and non-electrical, many of them new and novel, likewise are now to be found in the Annex where the surrounding are perhaps more conducive to judicious choice.

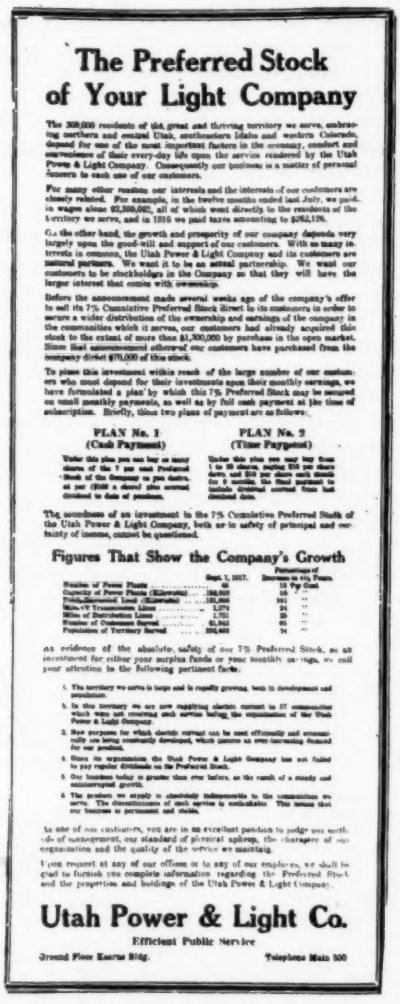
The Annex has now been made the headquarters for the exchange of Federal Dividend Coupons—the thrift idea—because the large assortment of moderately priced articles is expected to make choice easier, redemption quicker, and thus encourage the collection of many varied and useful electric appliances by those unable to buy expensive ones.

New Transmission Line Serving Coal Mines Proves Profitable.

The Morgantown Electric Division of the West Virginia Traction & Electric Company is now commencing to show increased income, due to the new transmission line built last summer. This increase in income now amounts to approximately $1500 per month and will doubtless continue to increase. The line itself is completed, and some six or seven additional customers are now engaged in installing their apparatus, so that they will be taken on within a very few weeks. All of this business is new coal-mining development of a very substantial character.

Financing Extensions Through Sale of Stock to Customers.

One of the very serious problems confronting the central-station company today is the difficulty in financing needed improvements and extensions, due principally to a sympathetic "slump" in the bond market. One very excellent manner in meeting this situation is by the sale of stock to customers. The advantages of this practice have been referred to in these columns on many occasions and the practice has been successfully employed by many utilities, notably by the central stations operated by H. M. Byllesby & Company.



The Preferred Stock of Your Light Company

The 300,000 residents of the great and thriving territory we serve, embracing northern and central Utah, southeastern Idaho and western Colorado, depend for one of the most important factors in the economy, comfort and convenience of their every-day life upon the service rendered by the Utah Power & Light Company. Consequently our business is a matter of personal concern to each one of our customers.

For many other reasons our interests and the interests of our customers are closely related. For example, in the twelve months ended last July, we paid, in wages alone $2,200,002, all of which went directly to the residents of the territory we serve, and in 1916 we paid taxes amounting to $262,120.

On the other hand, the growth and prosperity of our company depends very largely upon the good-will and support of our customers. With so many interests in common, the Utah Power & Light Company and its customers are natural partners. We want it to be an actual partnership. We want our customers to be stockholders in the Company so that they will have the larger interest that comes with ownership.

Before the announcement made several weeks ago of the company's offer to sell its 7% Cumulative Preferred Stock direct to its customers in order to secure a wider distribution of the ownership and earnings of the company in the communities which it serves, our customers had already acquired this stock to the extent of more than $1,300,000 by purchase in the open market. Since that announcement offered our customers have purchased from the company direct $70,000 of this stock.

To place this investment within reach of the large number of our customers who must depend for their investments upon their monthly earnings, we have formulated a plan by which this 7% Preferred Stock may be secured on small monthly payments, as well as by full cash payment at the time of subscription. Briefly, these two plans of payment are as follows:

PLAN No. 1 (Cash Payment)

Under this plan you can buy as many shares of the 7 per cent Preferred Stock of the Company as you desire, at par ($100 a share) plus accrued dividend to date of purchase.

PLAN No. 2 (Time Payment)

Under this plan you may buy from 1 to 10 shares, paying $10 per share down, and $10 per share each month for 9 months. No fixed payment to include dividend accrued from last dividend date.

The soundness of an investment in the 7% Cumulative Preferred Stock of the Utah Power & Light Company, both as to safety of principal and certainty of income, cannot be questioned.

Figures That Show the Company's Growth

	Sept. 1, 1917.	Percentage of Increase in 4½ Years.
Number of Power Plants	43	13 Per Cent.
Capacity of Power Plants (Kilowatts)	58,000	28 "
Total Connected Load (Horsepower)	125,000	101 "
Miles of Transmission Lines	1,071	24 "
Miles of Distribution Lines	1,701	29 "
Number of Customers Served	61,942	69 "
Population of Territory Served	300,000	34 "

As evidence of the absolute safety of our 7% Preferred Stock, as an investment for either your surplus funds or your monthly savings, we call your attention to the following pertinent facts:

1. The territory we serve is large and is rapidly growing, both in development and population.
2. In this territory we are now supplying electric current to 37 communities which were not receiving such service before the organization of the Utah Power & Light Company.
3. New purposes for which electric current can be used efficiently and economically are being constantly developed, which assures us ever-increasing demand for our product.
4. Since its organization the Utah Power & Light Company has not failed to pay regular dividends on the Preferred Stock.
5. Our business today is greater than ever before, as the result of a steady and uninterrupted growth.
6. The product we supply is absolutely indispensable to the communities we serve. The discontinuance of such service is unthinkable. This means that our business is permanent and stable.

To one of our customers, we are in an excellent position to judge our methods of management, our standard of physical upkeep, the character of our organization and the quality of the service we maintain.

Upon request at any of our offices or to any of our employees, we shall be glad to furnish you complete information regarding the Preferred Stock and the properties and holdings of the Utah Power & Light Company.

Utah Power & Light Co.

Efficient Public Service

Ground Floor Knutsen Bldg. Telephone Main 300

Recent Advertisement of Salt Lake Company.

The accompanying illustration shows a recent advertisement of the Utah Power & Light Company, Salt Lake City, which indicates that this company, too, has come to a realization of the benefits to be derived by having its customers financial partners.

Selling Electric Washing Machines at Muskegon, Mich.

The district office and store of Consumers Power Company, Muskegon, Mich., is just inaugurating a campaign for the sale of the Eden washing machine, manufactured by the Brokaw-Eden Manufacturing

Company, Alton, Ill. W. M. Lewis is district manager at this branch, the appliance sales department being in direct charge of H. H. Koelbel. It is proposed to start with a stock of 25 machines and make demonstrations in the store and in homes. This washer, which is a cylinder-type machine, is to be featured as a window display, and will be pushed along with the Christmas sales campaign. The machine can be operated with about one-sixth horsepower from an ordinary house lamp attachment. The plan is to send out salesmen to call on many of the light consumers. Some of these will be specialty salesmen who can put in a machine and demonstrate its utility. The Eden sells at $100 and is to be offered at cash or on installments covering a period of one year.

Field for the Sale of C-2 Mazda Lamps.

Since the introduction of the so-called daylight lamp, designated by the manufacturers as the Mazda C-2, there have been numerous inquiries as to the application of the units aside from show-window lighting and color matching in textile mills and in stores where colored merchandise is displayed.

The accompanying table gives a rather complete list of the possible field where these lamps can be employed to good advantage. The field for C-2 lamps is by no means limited to locations into which the color question enters. There are many locations, some of which are mentioned in the table, that are good fields for these lamps because the quality of light permits of better determination of the relation of objects, one to another.

Art Galleries	Industrial Plants
Art Studios	Jewelry Stores
Automobile Show Rooms	Laundries
Bakeries	Libraries
Banks	Meat Markets
Barber Shops	Metal-Working Plants
Beauty Parlors	Millinery Shops
Bill Boards	Offices
Candy Stores	Oil Refineries
Chemical Laboratories	Ore Grading
Cigar Stores and Factories	Packing Plants
Confectioneries	Paint Factories
Cotton Mills	Paper Mills
Counting Rooms	Photographic Supply Stores
Dental Laboratories	Printing Plants
Dentists' Offices	Reading Rooms
Department Stores	School Rooms
Display Windows	Sign Boards
Drafting Rooms	Silk Mills
Fruit Packing Plants	Sugar Refineries
Furniture Stores and Factories	Tailor Shops
Haberdasheries	Textile Mills
Hospitals	Tobacco-Working Plants

Public Service Company Secures 2500 Horsepower per Month New Business.

The commercial power load of the Public Service Company of Northern Illinois which has shown a steady increase, has, during the past three months, received additions averaging over 2500 horsepower each 30 days. The new connected power load thus far in 1917—figured to October 1—is equal to that of the entire 12 months of last year. Besides the new customers, many concerns already connected on have increased the size of their installations.

A number of important contracts for the service were signed in September, chief among which is one for 1000 horsepower with the Industrial Electric Furnace Company at Clearing, Ill.

Contracts for the wiring of 204 houses were made during September in all parts of the territory. The effort to multiply the number of houses connected to the service goes on, of course, systematically throughout the 12 months of the year. There are, however, two seasons set aside which are known as the spring and fall campaigns. The latter ends October 15 and the final returns—which are not compiled at this writing—will swell the total mentioned above in several of the cities and towns in all divisions supplied by the company.

More Isolated Plants Superseded by Central-Station Service in Louisville.

During the week ended November 2 the Louisville Gas & Electric Company secured the following new power business: 400 horsepower in motors for the operation of the entire plant of Gamble Brothers. 125 horsepower additional for the Auxton-Fisher Tobacco Company, 10 horsepower for the Rugby Distillery Company.

The Company secured a five-year renewal contract with the Puritan Cordage Company for their electric requirements amounting to approximately 200 horsepower; and closed contract with the Coca-Cola Bottling Works, covering 72 horsepower, to care for their enlarged plant.

Altogether the Company secured 83 new electric light and power customers with 79 kilowatts of lighting, took contracts for wiring 13 already-built houses, and the above power. New business connected to the Company's lines includes 40 customers with 42-kilowatts of lighting and 5 horsepower in motors. Electric energy output shows a gain of 21.3 per cent over the corresponding period a year ago.

Minneapolis Company Makes Big Gains in Power Business.

The Minneapolis General Electric Company during the week ended November 2 shows a gain of 186 customers connected to its lines, with 211 kilowatts of lighting and 891 horsepower in motors, which includes the following: 305 horsepower for Northrup, King Company, 200 horsepower for Moline Plow Company, 75 horsepower for Minneapolis Gas Light Company, 50 horsepower for Maxwell Motor Company.

The General Electric Company has begun the manufacture of lamps at its new factory and will be served by the Minneapolis Company to the extent of 400 horsepower in motors.

New business contracted for includes 475 customers with 284 kilowatts of lighting and 504 horsepower in motors. Contracts were closed covering the wiring of 31 already built houses.

Electric energy output during the week shows an increase of 17 per cent over the corresponding week last year.

Philadelphia Company Advertises for Co-operation in Enforcing Sign Order.

The Philadelphia (Pa.) Electric Company is using 30 column inches in the newspapers asking the co-operation of all of its customers and the public generally in the matter of limiting sign and display lighting according to the directions contained in the order of the United States Fuel Administrator—the order is printed in full in the advertisement. The company also sent out 10,000 letters asking co-operation in this economy.

Indications are that many of the sign users will limit them even beyond the requirements of the Government order.

Operating

Suggestions for Burning Low-Grade Fuels—Economy From Use of Boiler-Room Instruments—Motor Trucks for Pole Setting

NOTES ON BURNING LOW-GRADE FUELS.

A Resume of the Difficulties to Be Encountered and the Advantages That May Be Expected.

By Lionel Linnell.

The use of low-grade fuels has received a great impetus of late because of high coal prices, scarcity of coal and the movement toward the conservation of natural resources. Numerous articles are appearing in various places discussing the savings and benefits of burning low-grade fuels in the interests of economy. This is all very true, but only part of the tale is told. There are many difficulties in burning low-grade coals, there are difficulties in transporting it. Where proper provision has been made for using low-grade coal after careful investigation of what is to be expected and how best to accomplish it, success may follow. But the company that decides to suddenly turn to low-grade fuels because of their lower apparent cost—cost per ton, and not cost for given number of heat units, which is, after all, the criterion—in furnaces intended for other fuels may encounter many and unthought of difficulties. Every consumer of coal would at this time gladly reduce the coal bill, and with this end in view would like to know whether he could change over to low-grade fuels, what difficulties are to be expected, how to overcome them, and what the saving is going to be. The subject is a wide one, but a few remarks on various phases of the problem may serve to point out some of the factors entering into it.

Proximity of Production to Consumption.

The first facts to determine are what low-grade fuels are mined in closest proximity to the point of consumption, is the amount limited or unlimited within the demands made upon it, its cost and the cost of other coals, transportation charges from mine to furnace, characteristics of the coal—ash, carbon, volatile matter, moisture and sulphur, and in what form this latter appears. With this information it is possible to predetermine the performance of the coal when burnt with existing equipment, the change of equipment required, and cost of operation, and compare with existing costs. If there is a very real saving indicated by the use of low-grade fuel it is worth investigating further, but only after a thorough understanding of the requisites for burning this type of fuel and all the factors involved.

Transporting Low-Grade Fuels, Cost and Difficulties.

The cost of transportation is dependent upon weight and not heat value. Low-grade coals have comparatively low heat value, hence transportation charges, based upon heat value, are higher than for better grades of coal. Freight charges are rising and will rise yet higher, if the rate increases asked by the railroads are granted, hence as time goes on it will become more and more necessary to transport only useful material, and not, as some low-grade fuels contain, 45 per cent useless material in the form of ash. This ash not only is expensive as to freight charges, but it lowers the efficiency of the coal, detracts from the temperature of the furnace fire and then must be removed and shipped away from the plant, another item of expense. The cost of ash removal is a large item with low-grade fuels.

Low-grade fuel, because of the small particles chiefly, is subject to heavy loss in transit due to spillage through cracks in the coal cars and when handling. Unless shipped in gondolas which are in good condition the loss in weight from this cause may be considerable. Unless the cars containing the coal are protected from the wind, considerable coal may be blown away. These coals are largely hygroscopic, that is, absorb moisture which adds to their weight. During rainy weather they may easily absorb 25 per cent of their weight, which means that this same amount of moisture must be evaporated out, usually in the furnace, to further reduce the temperature. The greater the distance between mine and consumer, the greater the need for protecting the low-grade fuels from the elements.

Influence of Coal Characteristics Upon Performance.

The two characteristics of low-grade fuels that are really the cause of them being low-grade and that are responsible for nearly all the trouble and difficulty in burning them are the high ash content and the small volume of each individual particle.

The high ash content represents incombustible material of no heat value. It represents a heat loss in the carbon carried by it into the ash pit, by the heat required to raise it to the maximum temperature attained, by the heat taken by it to the ash pit. These all detract from the efficiency of the fuel. But perhaps just as objectionable is its influence upon furnace performance for it causes clogging of the furnace grate, interferes with the air supply and thereby prevents free combustion. To interfere still more is the fact that firedoors must be opened frequently to cut clinker and break the ashes, which causes cooling of the fire.

The size of the individual coal particles increases the difficulty of burning. The smaller the size of these particles, the more extensive and expensive the equipment necessary for burning them. Moreover, the smaller the coal particles, the lower appears to be the temperature developed, due supposedly to the higher ash content, proportionally, than for larger particles, which necessitates increasing the grate surface if outputs are to be maintained, since less heat from a given weight of coal means more coal must be burnt. Small coal also gives a denser fire, which makes it more difficult to pass air through it, and this necessitates more intense draft.

Burning Low-Grade Fuels.

For best results, mechanically stoked furnaces are necessary for low-grade fuels, if boiler capacity, firebrick arches and linings and draft troubles are not to be encountered. Clinker forms on the side walls of the furnace where it soon works havoc with the lining as well as clogging up the stokers. Exhaust steam, air and especial linings are being used to increase the life of the walls. The grates for burning low-grade coal of small particles must be designed for air spaces that will not allow the coal to fall through into the ash pit. This means that difficulties due to clinker are to be expected, unless some form of grate for slicing the clinker as the grate travels is employed, in addition to offering higher resistance to the air passing through the fire.

As lower-grade coals possess lower heating value per unit of weight, more coal must be burned for given boiler output, notwithstanding the greater difficulties of burning it. This means that these coals either cause a reduction of steam-making capacity or else must call for additional grate surface or rates of combustion. There are two ways of obtaining higher rates of combustion, one is to increase the grate surface, the other increase the intensity of the draft. Usually it is necessary to adopt both these expedients. These coals almost invariably necessitate replacing natural draft with mechanical draft for several reasons. Firstly, increased air is needed to obtain combustion; secondly, higher draft pressures are necessary to force air through the small air spaces in the grate; thirdly, a higher pressure is needed to force the air through the fuel bed, because the small particles pack closely together in addition to the obstructions offered by the clinker. Often the air pressure required would reach such pressures that air infiltration with induced draft and leakage outward with forced draft would be excessive, and in these cases a combination system of forced-induced draft is indicated. High draft intensity tends to cause clinker, especially where the ash is high in sulphur, and high air velocity means excess air which lowers the temperature above the fire, while it also carries coal particles up the flue. It is therefore usual to increase grate surface as well as increase the draft, not for the above reasons alone, however, but because otherwise difficulty might be encountered in keeping up capacity.

The larger amounts of ash contained in low-grade fuels result in marked increase of carbon in the ash. Some of this is unburned coal that has fallen through into the ash pit, some coal that is but partially burned. It does, however, represent a loss. The larger production of ash requires extra means of removing it, otherwise in an ash pit not equipped with automatic ash conveyor, and that is too small for the iob, the ash may rise up toward the grate bars sufficiently to seriously interfere with passing air to the fuel bed, and by preventing the radiation of heat from the grate bars cause them to warp and burn, shortening their life very materially.

The high air pressures usually necessary in order to obtain capacity are objectionable when firedoors must be opened to clean the fires as the inrush of cold air cools off the fire, causes smoke and may damage the hot boiler settings and heating surfaces. This necessitates special arrangements unless grates are to become choked, and for hand-fired furnaces, where the low-grade coal needs frequent feeding on a thin fire, small quantities at a time. In any case, with considerable pressure difference between inside and outside the furnace air infiltration is prone to occur unless all cracks and crevices are carefully closed whenever they occur.

Only some of the features and factors concerned with burning low-grade fuel have been mentioned. They suffice to show, however, that the change from better to poorer grades of coal is a radical change, both as regards equipment and firing methods. Grates, settings and draft have to be modified and even so the capacity will be less than with higher grades of coal. There is a larger amount of ash to dispose of, which may eliminate a saving due to the lower price of the poorer grade of coal.

Where large amounts of coal are burned, and where the saving in price leaves good opportunity to pay for the higher initial cost of equipment, and where the disposal of the ash entails little expense, low-grade fuel can with advantage be used, as it is being used. But where this low-grade fuel must be shipped long distances and deteriorate during transit due to absorbed moisture and loss by spillage, to be burned in plants designed for other grades of coal, the matter may or may not be different. In any case it is one for careful and deliberate investigation and not for hurried and sudden adoption.

Boiler-Room Instruments Insure Economical Operation at Toledo.

Much effort has been expended recently at the Water Street plant of the Toledo (O.) Railways & Light Company to develop and improve boiler-plant efficiency. As a means to that end, many recording and indicating instruments have been installed. The following extract from a paper read by George M. Coughlin of the Toledo results department, before the local Doherty Training School will undoubtedly be of interest to those who are concerned with boiler operation:

"In order to check the operating men and to give them continuous operating guides, we have had to devise ways to record all important operations, until now we have effective checks on practically all important heat losses. We can tell just when a fireman blows down any of the boilers, which boiler was blown, the hour and the length of time blowing. We can tell if all the available exhaust steam is used to heat the feed water. We know the temperature of the feed water at all times, together with the height of water in the heaters, if the heaters overflow and when. We know the amount of feed water fed to the boilers and the amount of water used to make up our loss through blow off, pop valves, etc. We know whether the proper deferential is kept between the boiler-feed water pressure and the steam pressure. We know every time a fireman opens his feed door to look at his fire. We know at all times with what efficiency the coal is being burned in each furnace, the amount of steam each boiler is generating and the condition of the fuel bed at any time of the day. We can tell just when the mechanical soot blowers are used on the boilers, the hour and the length of time blown. We can see on the flue-gas thermometers just what is the temperature of the escaping gases at all times. We know whether the water is fed to each boiler intermittently or continuously. All this is on charts giving continuous records; some have only one, but the complete set gives us the vital records so necessary to efficient boiler-room operation. In the turbine room we have similar records covering all of the vital points of efficient turbine-room operation."

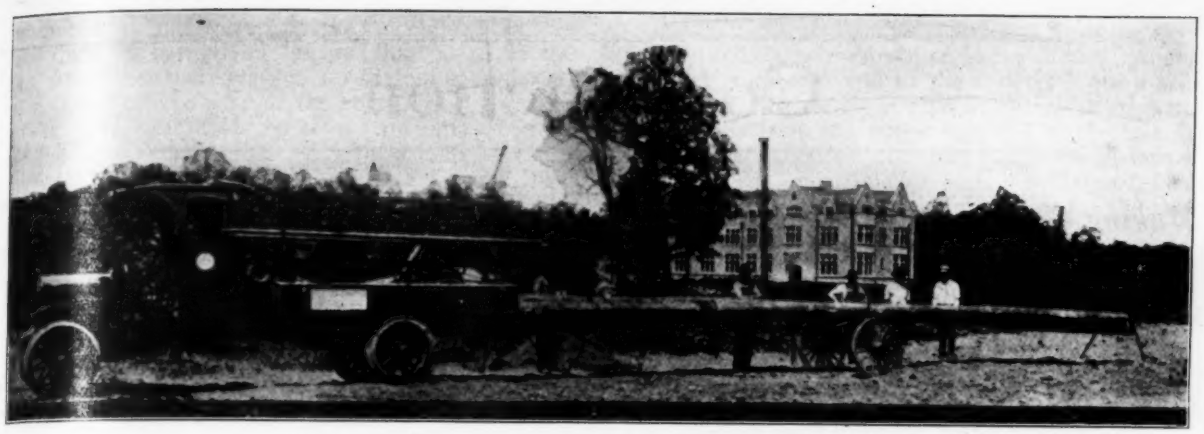


Fig. 1.—Motor Truck Transporting Pole to Construction Site.

MOTOR TRUCKS USED IN INSTALLING POLES.

Winch Attachment Simplifies Operation and Effects Tremendous Saving in Labor.

The employment of motor trucks for erecting poles is coming into wide use by utility companies because of the economy of this method and the great saving in labor. Many truck manufacturers, both gasoline and electric, are now prepared to equip vehicles intended for this service with a simple winch, controlled from the drivers' seat, which accomplishes in a few minutes with one man what under the old conditions was a laborious task, requiring from 10 to 12 men. In other words, by means of the motor truck only about one-half as many men are required in a line crew as under other conditions.

The two accompanying illustrations show a General Motors truck employed in transporting and erecting a pole in connection with line construction work at Camp Gordon, Ga. Fig. 2 shows one man engaged in raising the pole into position with the aid of the winch installed on the side of the truck. The men with gaffs are simply guiding the pole as it is raised, the entire operation only lasting a few minutes, after the hole is dug.

How the same truck can be used for transporting poles is shown in Fig. 1.

Danbury Firemen Win Bonus.

The Danbury & Bethel (Conn.) Gas & Electric Company has started a bonus scheme for the firemen which is reported to be very promising. The coal is weighed over each eight-hour shift and the electric output is also noted. Shifts are changed every month so that a cycle is completed every three months. The bonus is distributed at the end of each cycle to the firemen who have the lowest fuel consumption per-kilowatt-hour and also to the firemen having the next best record. The competition for the highest honors was close as is shown by the figures of 4637 pounds of coal for kilowatt-hour, and 4649 pounds of coal per kilowatt-hour which were made by the two closest competitors.

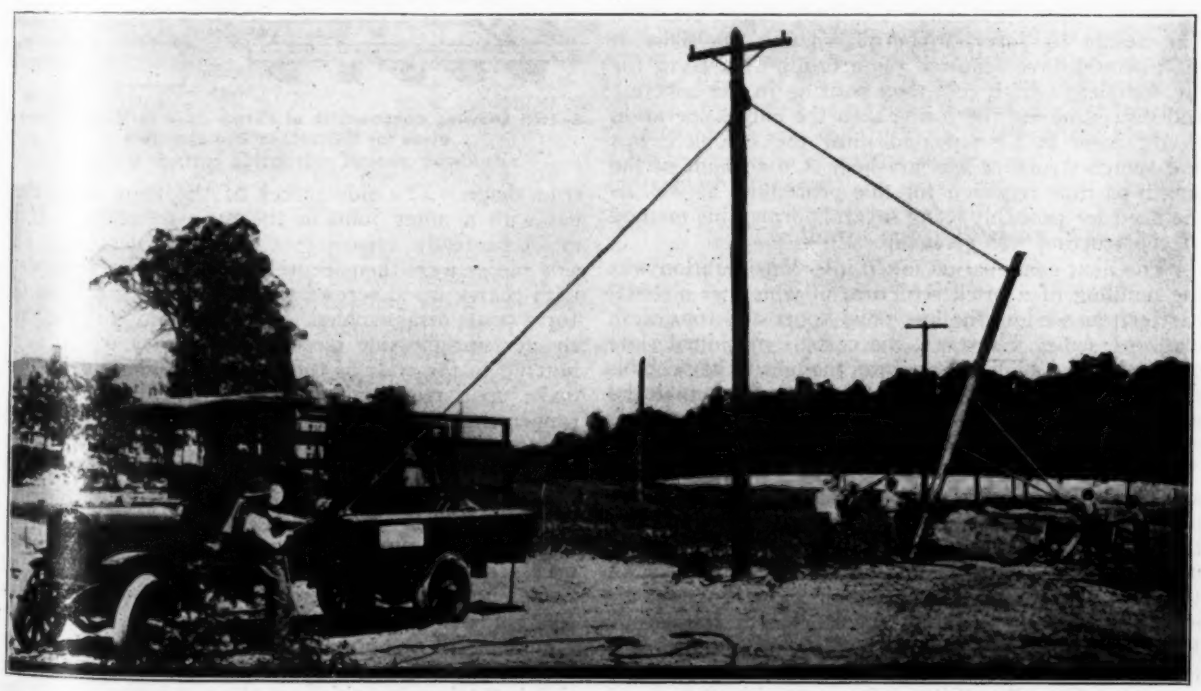


Fig. 2.—Erecting Pole With Aid of Motor-Operated Winch.

Construction

Making Concrete Slabs for Switch and Bus Cells—Some Construction Kinks—Doings of the Contractors

PRECASTING CONCRETE SLABS FOR USE IN SWITCH AND BUS STRUCTURES.

Design of a Form Which Permitted Concrete Slabs to Be Made at Great Economy Over Slate or Brick Structures.

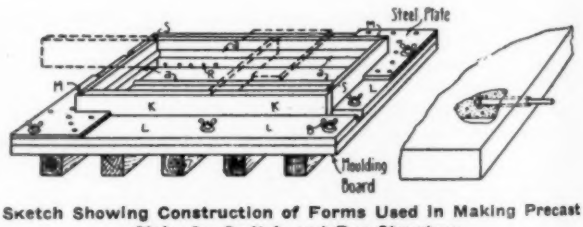
In the large modern power station the high-tension busbars and oil switches are usually placed in separate compartments, both for the purpose of insulation and so as to isolate any short-circuits or other troubles that might occur. The usual practice has been to build these compartments with brick walls, however occasionally using slate, soapstone, concrete or similar slabs where it was necessary to have a relatively thin wall between adjoining cells.

In building the switch house for the new electric power station No. 5 at Rochester, N. Y., the problem was presented of making such a selection of materials as was especially suitable for the conditions to be met. The bus and oil-switch compartments were to be located on the third gallery, which meant carrying the floor stresses through the columns to the ground floor. Obviously it was desirable to keep the weight of these columns as small as possible; consequently the use of a structure built entirely of brick was out of the question. Concrete was next considered and designs were made not only for the slab, but also for the necessary forms. Then these also were abandoned, on account of the very complex formwork necessary in order to get the shapes that were required and to make the forms adaptable for progressive erection. The design of forms to permit casting the slabs in place would have required the erection of a form for the complete switch cell, then pouring in the concrete and disassembling the form; then the entire operation would have to be repeated until the complete bus and switch structure was finished. On account of the length of time required for this procedure, as well as the need for probably using several forms, this method of construction was given up.

The next combination taken into consideration was the building of a brick structure in which all internal barriers, as well as the bus cells, floors and tops were made of slate. However, the cost of machined slate of the dimensions necessary was thought to be prohibitive and the probable delays in delivering this material would also have been a very serious objection. This construction was therefore abandoned.

The final choice was the use of precast concrete slabs, as substitutes for the slate considered in the preceding plan. Such precast slabs possess few objections. The design of the form and the method of making these slabs was described by Mortimer D. Gould in a recent issue of Gas and Electric News, the monthly company organ of the Rochester Railway & Light Company. This article points out how the relatively few difficulties of this construction were overcome satisfactorily. Slate being a machined piece of stone could be worked to much closer dimensions than it was thought possible to obtain by pouring a slab of concrete into a wooden form; the slate would have a perfectly flat surface also, whereas it is difficult to make a reasonably flat concrete slab. It was evident that the form and the manner in which it was constructed were of great importance. It was first thought that it would be necessary to make forms of steel plates and angles, but the cost of this material being high and its delivery uncertain, this idea was abandoned and a wooden form adopted in some respects similar to the steel form first considered.

The method of building the form is shown in the accompanying illustration. It consisted of a flat surface molding board made of well shellaced matched lumber and very securely fastened by lag screws to cross studs spaced close enough together to prevent the surface from warping or springing out of true from handling. The sides of the form were made up of a wooden angle section with a broad flat leg *L*, which was bolted tightly down to the molding board by the bolts *B*. These side angle sections were securely screwed together with the coarsest flat-head screws *R* obtainable to make a strong angle section that was light in weight with a minimum of wood to prevent taking up the water and thereby warping them out of



Sketch Showing Construction of Forms Used in Making Precast Slabs for Switch and Bus Structure.

true shape. The side pieces of the form were then cut with a miter joint at the opposite corners *M* to make perfectly square corners of 90 degrees. The side pieces were then securely fastened by a steel plate with coarse wood screws to prevent racking when the form was disassembled. The ends *S* of the two shorter upright side pieces were cut square so as to butt up to the ends of the two longer side uprights to make up a rectangular box for the form. This arrangement allowed slabs that had the same thickness and width dimensions but of various lengths to be made from the same form as shown by the dotted lines in the sketch. The sides of the form were fastened to the molding board with wingnuts and bolts *B* so they could be slipped away from the slab. This was necessary as many of the slabs had a half-round tongue or key cast in them for erection purposes. This was obtained by nailing a piece of half-round molding *a* on the side or bottom of the form where necessary. The removal of these side pieces quickly after the slab had taken its initial set allowed better ventilation

and quicker permanent set in the cement. Then the slabs could be carried on the molding board to the place where they were stacked for seasoning and carefully slipped off the edge of the board.

The slabs were made up of a 1 to 2 gravel grout and the larger ones reinforced with No. 26 key lath. Some of the slabs were cast with a hole through their entire length for a bolt by using a piece of ordinary tin speaking-tube for a form; they were reinforced by two pieces of metal close to each plane surface. In order to get the metal located at a uniform depth in the slab a screed was cut of the proper dimension and drawn across the grout to spread it in the molding board the required thickness. Then the metal was placed and more grout put on top, the same process being repeated for the second piece of metal and the surface troweled.

Many of the slabs were cast with provisions for suspending them from the ceiling or bolting them to some other part of the structure. For this purpose a detail quite the reverse of the ordinary practice was resorted to, for the reason that a bolt cast into the slab and left protruding would make an ideal projection which would be fastened to a rope or grasped by the hand while the slab was being moved. As these slabs had to be handled quite "green," due to the lack of time for their manufacture, it was not wise to have them broken by such a detail. The method used was to imbed a nut in the slab using a pipe thimble and washer as a spacer for a bolt and then remove the bolt as the side of the form was disassembled, as shown at the right in the illustration.

The cost of making slate in the sizes used would have been $1.40 per square foot of surface for material two inches in thickness. The number of precast pieces made was 564, containing 33 cubic yards and having a one surface area of 4354 square feet, thus making a saving over slate of about $5000. Harry B. Reed was in charge of the work in the field. He reports unit costs of making the slabs as follows:

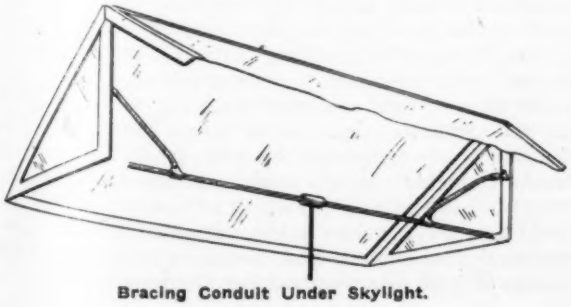
Cost of Making Concrete Slabs.

	Per sq. ft.	Per cu. yd.
Labor	$0.16	$21.48
Material for slabs	.12	15.53
Material for 17 forms	.06	6.82
Total	$0.34	$43.83

Mounting Lamp Directly Below Skylight.

By Joseph Pertle.

In wiring a building recently the owner told me he wanted a light put directly below the center of a skylight which had a bottom opening some 12 feet across. The wiring was all in conduit. To run an unsupported conduit across was evidently not satisfactory, consequently I had to have some kind of intermediate support without interfering with the skylight. I used the scheme shown in the sketch. About three feet from each end of the conduit I put a tee. Then I bent two pieces of pipe of the same stock to act as braces from the upper supports to the tees as shown. A common fixture stud was screwed into a coupling at the upper end of each pipe brace. This made a strong and satisfactory mounting for the outlet box in the center.

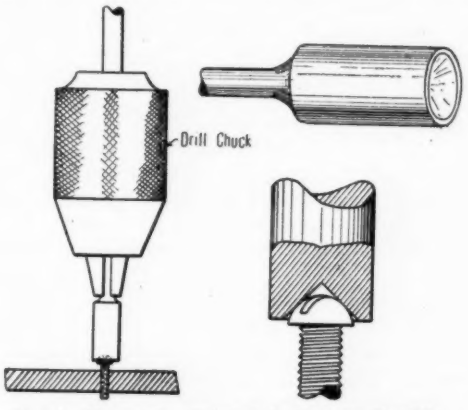


Bracing Conduit Under Skylight.

Driving Round-Head Screws Rapidly.

By Harry B. Stillman.

Where there are a large number of fuse blocks to be screwed on a panelboard, for instance, or any pieces of work where there are many screws to be driven in, considerable time may be saved by taking a brass or iron rod 5/8 or 3/4 inch in diameter and drilling or countersinking one end just deep enough to fit the head of the screw. The drill used in countersinking should be ground off to a taper or a point, which will give a more conical hole. By filing in several notches this will give the tool a better grip. By turning off the shank end, the tool may be used in either a drill press or a lathe and the screws may be run in by power. If the screws have a nickeled or polished finish, the tool may be made of fiber and there will be practically no danger of grinding or marring the finish. This method is much more safe than using a screw-driver blade in a bit brace, since often the screw driver will slip out and scratch the work.



Simple Means for Driving in Screws Rapidly.

Twisting Copper Busbars.

By H. Barnum.

In wiring switchboards, control panels and the like, it is often necessary to make a connection between two busbars that face in different directions, one being flat and the other edgewise. Evidently one bar must be given a body twist of 90 degrees. Many electricians are afraid to bend a bar or else are at a loss as to how it is to be done. Usually it may be twisted in a fairly simple manner. Mark on the bar where the bend is to be made, place it in the vise, edge up, and put a strong monkey wrench on the spot marked. Then, taking a firm hold of the handle, it will be found that the bar can be bent around until the wrench is in an exact vertical position. If the bar is a fairly heavy one, it may be necessary to put a short length of pipe over the handle of the wrench in order to secure greater leverage.

AMONG THE CONTRACTORS

Carle Electric Company, of Akron, Ohio, has been awarded contract for electric wiring in the annex to Grace School at Akron; contract price is $2473.

C. E. Beasley, of Lakewood, Ohio, has been awarded the contract for wiring a fine residence for W. E. Edwards at Lakewood, a suburb of Cleveland.

The Youmans Electric Company, Inc., 45 Main Street, Yonkers, N. Y., electrical contractor, has established a branch office at 17 West Forty-second Street, New York City.

The Progressive Electrical Company, 737 Prospect Avenue, Cleveland Heights, has received the contract for wiring a residence for C. B. Walkey at Cleveland Heights, Ohio, a Cleveland suburb.

H. Carpenter Company, Meadville, Pa., has accepted contract for electrical work in a new three-story concrete and brick fireproof foundry building for the Meadville Malleable Iron Company.

Fitch Electric Company, 1005 East 105th Street, Cleveland, Ohio, has the contract for electrical work in 15 residences being built for P. J. O'Donnell at Demington and Scarborough Roads, Cleveland.

Dunn Electric Company, Grand Rapids, Mich., is wiring the new school building at Vassar, Mich., the other electrical work amounting to $1400. A motor-driven ventilating fan is being installed in the basement.

Westinghouse-Church-Kerr Company, New York City, has received the contract for constructing a large power plant at the torpedo station at Newport, R. I., at a contract price of $850,000. Much electrical work will be involved.

The G. E. Engineering Company, Inc., 417 Canal Street, New York City, has been awarded the contract for the electric power distributing system at the Navy Department's new big munition plant at Charleston, W. Va.; the contract price is $26,711.

M. C. Latimer, of the Burdorf-Brecher Company, Louisville, Ky., electrical fixtures and lighting devices, was one of the charter members of the Display Men of Louisville, a recently organized association of the window decorators of that city. He himself is a display man and is further interested in seeing to it that the window decorators of the city understand the principals of correct lighting and that they make use of the best appliances for their purposes.

Enterprise Electric Company, Grand Rapids, Mich., has in progress the wiring and installation of electrical equipment in the Fountain Street High School building in that city. Besides putting in conduit wiring for lighting circuits, three motors are being installed. There is a five-horsepower motor to operate vacuum cleaners; one of 10 horsepower for driving a hot-air circulating fan, and a three-horsepower motor to operate shop tools in the manual-training department.

W. M. Ackerman Electric Company, Grand Rapids, Mich., recently completed the wiring and the installation of lighting fixtures in the new Baptist Church edifice in that city, the contract amounting to $3500. Luminous-bowl, X-Ray indirect lighting fixtures were put in. The principal center fixture is 6½ feet in diameter, and has a lighting capacity of 5000 watts. Then, in the balcony are smaller units of the same style. Another conspicuous piece of work recently completed by this company was the conduit wiring and putting in of complete lighting fixtures in the new building of Calvin College. The main chapel has fixtures of special design, whereby it will be illuminated from six artistic hangers of a combined capacity of 40,000 watts, flooding the chapel with indirect light; and 40 to 50 class rooms are illuminated from single-unit luminous-bowls indirect fixtures. The electrical work and fixtures cost about $7000. Current is supplied to this college by the Consumers Power Company.

John S. Noel Company, Grand Rapids, Mich., makes a specialty of the better class of commercial and residential electric lighting installations. A number of fine residence buildings in Grand Rapids have been thus equipped this year. One is that of C. E. Peterlein, cost $25,000, in which a fine lighting installation was put in. The Evangelical Lutheran Church, which had not been electrically lighted previously, has been wired and equipped with modern fixtures by this company. It now has indirect lighting from six bowls in each of which are two 300-watt lamps; and under the balcony are 14 lamps of 75 watts each, all these being the Mazda C type. The vestibule is lighted by three bowls, each with a 100-watt lamp. Other contracts this year included the rewiring and placing of fixtures in the remodeled George Ellis bank building, which provides for semi-indirect bowls and cast metal side lights. Another piece of similar work was for the Western Canning Company, at Petoskey, in which lighting was provided for the offices, laboratory and work rooms. The Noel company is under the management of E. S. Ellis.

The Grand Rapids Electric Company has completed an important contract, covering the installation of electric power equipment in the woodworking factory of the Hays Ionian Automobile Company, of Grand Rapids, Mich., in which automobile bodies are made. The power is generated by a 250-horsepower Corliss engine, direct-connected to an Allis-Chalmers alternating-current generator. The necessary switchboard, with power and lighting panels, was put in position and connected up; and 50 440-volt induction motors were installed. About half of these are belt-connected to machines, the others being each built into and forming a part of the individual machine. Cabinet boxes were placed in all departments for motor control. This contract amounted to $25,000. Another contract, in course of execution by this company, is the wiring and installation of lighting fixtures in the new high school building at Manistique, Mich. A Crocker-Wheeler generator was recently installed by the same company in the Leonard Industrial Building. The generator is driven by a 250-horsepower Buckeye engine, proviously installed; and the current produced serves to operate motors which previously had derived their power from another source. Another new feature was the installation of 50 meters in this 9-story Industrial Building in which floor space is rented and power sold to tenants who are engaged in many lines of light manufacture. The wiring contract in the Steketee department store building, Grand Rapids, just completed by this company, required black enameled conduit work, and amounted to $10,000. Lewis P. Cody, president of Grand Rapids Electric Company, is active in the Michigan Electrical Contractors' Association, and thinks very highly of the Goodwin plan for reorganizing the industry.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 407.—MAGNETIC BRAKE.—The coils on a magnetic brake for an Otis elevator give trouble by burning out frequently. Each segment has 143 turns of No. 11 wire and two segments are connected in series across 240 volts. I would like suggestions for rewinding the coils to eliminate the trouble without changing the magnetic pull.—S. A. B., Reno, Nev.

No. 410.—MAGNETIC PROPERTIES OF NICKEL-PLATED BRASS.—In making a nickel-plated brass body for compasses, we recently have occasionally had trouble from certain batches of the bodies showing that they were magnetized more or less. The plater claims they are all handled the same way and treated exactly alike. We sometimes get hold of some of the compass bodies plated many years ago in the same plating outfit and these are entirely free from magnetic effects, although plated more heavily than we now plate them. Now on certain days a large percentage of the bodies is found magnetized, while on other days the output is practically free from this trouble. As a compass must be free from such difficulties, we should like some help in clearing up the cause of the trouble.—C. E. H., Grand Rapids, Mich.

No. 411.—TERTIARY WINDING ON INDUCTION COIL.—Please explain the purpose and action of the tertiary winding in a tertiary-wound induction coil, such as those used on some types of American Telephone & Telegraph Company's telephone switchboards.—F. G. H., Birmingham, Ala.

Answers.

No. 406.—SMALL CENTRAL-STATION ICE PLANTS.—Under what circumstances would the small central-station company be justified in going into the ice-making business? What are the factors involved?—E. G. R., Chicago, Ill.

The small central station would be justified in going into the ice-making business wherever there appears a reasonable profit in the venture. It would not, however, be justifiable for the central-station company to enter into competition with one of its customers obtaining energy from its lines unless there were ample demand for ice from both plants.

There are two aspects to this question, the financial and the legal, the former depending upon the latter. A central station in some states possesses a franchise entitling it to do certain things. The manufacture and sale of ice may or may not be included. If it were not, and the state utility commission had jurisdiction, it would be necessary to obtain its permission before entering upon the project. The same applies to cold-storage houses, except here utility commissions have the right to regulate prices, which they have not with the sale of ice, I believe:

There are many small lighting companies that operate ice plants scattered throughout the country. A list can readily be obtained through the good offices of the National Electric Light Association or the periodical, Ice and Refrigeration, published in Chicago. It might be advisable in some instances for the ice-making plant to be privately owned instead of being owned by the central-station company, as this might save legal entanglements and prevent accusations of ulterior motives. This could easily be accomplished by some of the central-station officers going into the ice-making business as an additional field of endeavor. The central-station company would by this still reap the benefit of the relatively high energy consumption during the hot months, high as compared with the maximum demand and connected load, and thus gain a load of high load-factor and the income represented thereby without the element of risk, and profit or loss, of the ice-making business.

Before entering into the business of making and supplying ice to a community it would be necessary to determine the existing consumption of ice and estimate the possibility of increasing it normally and otherwise; the existing supply and to what extent it met the demand; the price at which ice could be bought throughout the year; proportion of manufactured and natural ice marketed and sold and relative price of each; portion of the year during which ice was needed, and what amount each month in the twelve. Knowing these things, it would then be possible to decide whether there was sufficient demand to justify an additional supply and at what price that ice would have to be sold to meet competition. Moreover, with statistics to hand showing the ice consumed each month throughout the year, it would be possible to determine the size of machinery to install, such as would be suitable for supplying the maximum amount during the summer and yet be able to run efficiently during the months of small demand.

With the monthly capacity of the plant approximately determined, with a margin for normal growth, and the production cost fixed, plus a profit to cover contingencies, known and unforeseen, it remains to design a plant that will produce ice at the price determined. This will not be a simple matter nor of very reliable result unless done by one familiar with ice plants, their erection and operation. However, for anyone desiring to go into the subject, the writer would recommend reading "Central-Station Service in the Manufacture of Artificial Ice," by Charles J. Carlsen, a paper read before the National Electric Light Association at its Chicago convention in 1916.

Perhaps there has never been a time when foodstuffs had higher intrinsic or economic value than now. There is little reason to suppose conditions will differ radically for many months, even should hostilities cease late next spring, for long after peace the United States will furnish ravished Europe with food and fodder for man and animal. High food prices will therefore remain, and the cold-storage house and the domestic ice box will prove big assets in the conservation of food and stabilizing of prices. The high cost of foods and the necessity for using them effectively has caused to spring up a pronounced movement of thrift. The masses are realizing that money spent on ice is an economy during the warm months and this lesson will probably remain after the war, because a domestic ice box well filled preserves food, conserves health and improves the palatableness of the foodstuffs. This means that the annual consumption of ice per capita will increase rather than the reverse.

One very large item in the cost of selling ice is that of delivery. The electric battery truck will be found particularly economical in connection with the electrically driven ice plant, since the ice plant proper and the battery-charging set may be metered through the same meter, thus increasing the total energy consumption and load-factor and reducing the rate for energy. Moreover, the electric battery vehicle can be made to take the place of several horses when needed, and usually when the hot weather comes horses fail, whereas the battery operates most efficiently.—K. R., Chicago, Ill.

New Appliances

Porcelain Locking Socket—Space Heaters—Extension Reel—Big Jib Crane—Tungar Rectifiers—Electric Floor Machine

Porcelain Shurlok Socket.

The firm of Pass & Seymour, Inc., Solvay, N. Y., has recently placed on the market the Shurlok porcelain socket, illustrated herewith. The marked advantage of the Shurlok type of socket, which has come into extensive use, is that it provides a practical means of locking the lamp in the socket so that it cannot be removed without the use of the master key. The special description given below is worthy of the attention of electrical men not yet familiar with the unique device.

The Shurlok screw with the special head is carefully designed so that it cannot become lost or misplaced. The lamp base is carefully positioned in the socket shell by especially placed ribs or corrugations on the inside of the porcelain shell which prevent the lamp from being forced out of perfect alinement with the socket.

The porcelain Shurlok boss or extension is of rugged construction; the socket is not damaged in ordinary rough usage that a porcelain socket is subjected to.

These sockets are recommended for use over machinery, radiators, in public halls, basements, warerooms, store houses, shipyards, piers, freight houses, breweries, etc.; for use in abattoirs and all plants devoted to canning, condensing, drying, evaporating, cooking or in any way preparing food products, because these sockets are not affected by the high percentage of steam, moisture or humidity that prevails.

New Porcelain Shurlok Socket.

The porcelain shell is not disintegrated by any of the acids, fumes or gases which are present in these plants and which are found to be destructive to metal socket shells. P&S porcelain is said to resist the chemical action of acids, fumes and gases by reason of its peculiar vitreous composition and freedom from ingredients which they will attack.

Standard porcelain sockets or receptacles are each composed of a body and a cap or base. When the lamp is removed, the retaining screws are made accessible and the socket may be removed from the wires. This incurs the loss of a socket and consequently the inconvenience resulting from the fact that a new socket must be installed before a lamp can be used.

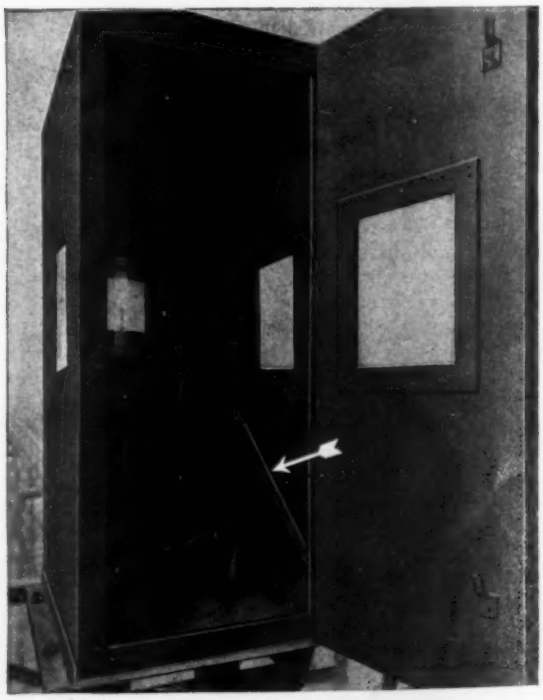
In locking the lamp in by means of the Shurlok device, the shell and cap of the socket are locked so that they cannot be taken apart.

A wide variety of locking sockets and receptacles is now obtainable because the porcelain Shurlok body is, of course, interchangeable with the complete line of porcelain caps and bases made by the Pass & Seymour corporation.

Heating Crane Cabs, Valve and Pump Houses, and Simliar Remote Compartments Electrically.

The C-H electric space-heater unit marketed last fall to industrial plants (particularly steel mills) has now been put up in cartons of 10 each. Users have found it desirable to carry such standardized heating units in stock, since uses for them frequently arise during the cool months of the year. The cartons are labeled and stamped with the voltage (115, 230 or 250) for which the units contained are designed. One of the new units is installed in the gas-valve house of

Carton in Which C-H Electric Space Heaters Are Shipped.



Application of a C-H Space Heater Unit in a Meter House.

the coke plant of the Corrigan-McKinney Company, Cleveland, Ohio; it is mounted against the side near the floor. In this same plant also, besides those in the crane cabs, there is located a unit in the meter house on the charging bridge of the coke oven. It is obvious that electric heat provides the most flexible and convenient means of heating in such detached and remote places and is more economical than running a long steam pipe thereto. The units illustrated are of 500 watts capacity and are made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Automatic Extension Reel for Electric Lamps.

In garages, machine shops, basement storerooms and the like it is often necessary to use an extension lamp to examine shaded parts of machines or to look for material that is located on dark and obscure shelves. For this purpose an extension lamp that is always convenient by being permanently connected, and which at the same time will not allow the cord to be tangled, is highly desirable. This need has been met by the Cincinnati Specialty Manufacturing Company, Cincinnati, Ohio, with the type of automatic reel illustrated herewith.

This reel is 9 inches in diameter and 2 inches wide and is arranged for winding up 25 feet of reinforced

Automatic Reel for Extension Lamps.

lamp cord, to which is attached a weatherproof socket equipped with lamp and guard. The reel is arranged to swivel on a vertical axis, as well as to revolve on its horizontal axis. Special well adjusted brushes make connections for each of these motions. It is evident that this construction permits the lamp to be taken to any portion of the room in a practically straight line, the cord at the same time being kept taut, so that it does not drag on the floor or become tangled. The cord passes through a special bushing, which prevents injury to the insulating cover and at the same time guides the cord on the reel. A simple automatic lock is arranged, which permits the reel to be locked whenever the desired length of cord has been run off. This lock is set by giving a slow backward motion of the cord, which is caught and held in place at that point. To release it the cord is given a slight forward pull, which unlocks the catch and it can then again be automatically reeled up by retreating to the reel.

Double insulation is provided at all contact points, both through the heavy insulation of the wires and through fiber bushings. The insulation is so perfect that these reels have withstood an alternating-current potential test of 1250 volts, although only 250 volts are required in the specifications of the Underwriters' Laboratories, which has fully approved this device. This reel can be installed either directly on the ceiling or on a beam or conduit and is very quickly mounted in place. It is neatly and attractively finished, the side disks being black enamel and all other parts polished nickel.

Powerful Electric Jib Crane.

What is said to be the largest and most powerful jib crane ever built has been completed by the Wellman-Seaver-Morgan Company at its Cleveland, Ohio, works and is now in service at one of the United States Navy Yards on the Atlantic Coast. This crane is mounted on a floating pontoon. It has a total reach with its jib extended of 105 feet and can lift more than 200 tons. This gigantic crane looks much like a revolving derrick, which is rotated until the jib comes opposite the work to be lifted. When raised to its maximum height, the top of the jib is 200 feet above water level. The boat on which the crane is mounted contains a complete boiler, engine and generator plant, the engine and generator being direct-connected. All of the operations of the crane are performed by electric motors, which are controlled from a small house mounted high above the deck of the boat. A single operator can control the entire outfit. Dynamic braking is provided for the motors, which gives very perfect control in lowering the loads and has been found greatly superior than the use of the more common mechanical brakes. In case of accidental interruption of power supply the crane motors are automatically locked by means of magnetic brakes, so that the load cannot be dropped. This crane is used principally for lifting large guns, turrets, boilers, turbines and other heavy machinery into battleships and other large navy vessels.

Motor-Operated Razor-Blade Sharpening Machine.

The Henderson Machine Company, Cincinnati, Ohio, has developed the Youngs automatic razor-blade sharpening machine, which is motor-operated. Dull blades of any make are put into the machine at one side, this being the only hand operation. All other operations are automatic and dependent on a fractional-horsepower motor manufactured by the General Electric Company. These motors have been adopted as standard equipment and consume less current than a 16-candlepower incandescent lamp, or 60 watts. The blades are conveyed across the machine during the honing and finishing processes, so that they receive the diagonal or barber's stroke, at the rate of 60 to 120 edges per hour.

Oilless bearings are used and the drive is noiseless, with self-adjusting friction drive. By means of a conveyor the need for an attendant is eliminated and the device is suitable for a window display.

It is stated that $10 to $20 a day can be made resharpening safety-razor blades with this machine, and that it can be operated by even as unskilled a person as an errand boy.

The New Tungar Rectifier for Battery Charging and Similar Service.

A new type of alternating-current rectifier has been recently perfected at the research laboratories of the General Electric Company and standardized in several convenient commercial types. The preliminary forms of it were described in our issues of December 23, 1916, and March 31, 1917.

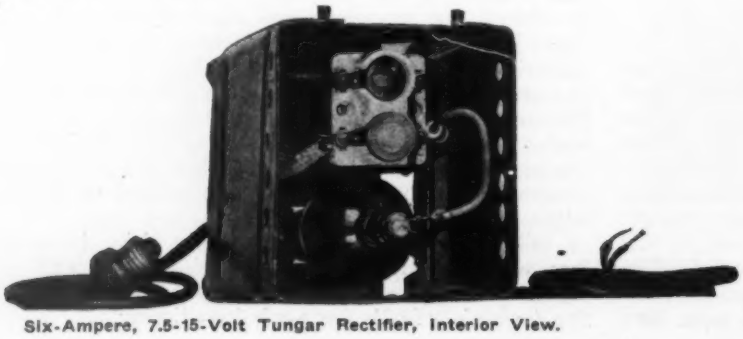
While alternating current is generally suitable for light and power, in a great number of instances, such as storage-battery charging, electroplating, etc., only direct current can be used. Since in most cases only alternating current is available in cities and villages where there is electric service, the demand for rectifiers, especially in the smaller sizes, is very large.

Two-Ampere Tungar Rectifier.

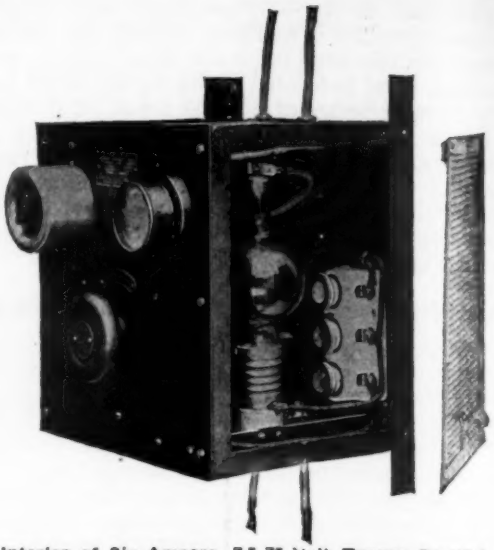
The new Tungar rectifier is a hot-cathode, argon-gas-filled device. The principle is entirely new, although it has long been known that a vacuum tube containing a hot and a cold electrode acts as a rectifier. The device consists of a small glass bulb, similar to an incandescent lamp, in which the rectification takes place; a small compensator, or transformer, which reduces the alternating current without wasteful resistance; a fuse and an inclosing case. The Tungar rectifier bulb, filled with inert argon gas at low pressure, contains a low-voltage tungsten filament and a graphite anode. It is from the combination of the tungsten cathode and the argon filling that the device gets its trade name of Tungar. The glass bulbs are inexpensive and will last for hundreds of hours of service.

Principle of Operation.

It is rather difficult to explain the operation of the Tungar rectifier to the ordinary business man. The



Six-Ampere, 7.5-15-Volt Tungar Rectifier, Interior View.



Interior of Six-Ampere, 7.5-75-Volt Tungar Rectifier.

bulb rectifies the alternating current for the reason that during the half cycle when the incandescent tungsten filament is negative, the electrons (tiny particles of negative electricity) emitted from it are being pulled toward the anode by the voltage across the bulb, these electrons colliding with the gas molecules and ionizing them, that is, making them conductive in the direction of anode to cathode; while during the other half of the cycle, when the filament is positive, any electrons that are emitted are driven back to the filament, so that the gas in the bulb is conductive during that half cycle.

In other and less scientific words, for one half cycle a current flows from the graphite anode to the tungsten filament, but in the other half it cannot flow across the gas-filled space, so the current flowing through the battery cells is always in one direction.

When the proper connections to the battery are made, and the rectifier is connected to the alternating-current incandescent lamp socket, the device will start charging immediately. The tungsten filament in the bulb lights, and there will be seen a purplish glow between the cathode and the anode, or between the filament and the graphite. A slight hum is also noticeable while charging.

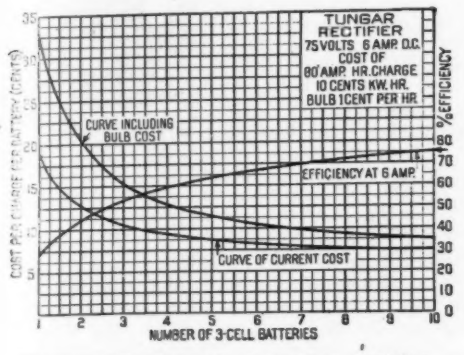
These rectifiers may be used for charging all small storage batteries, such as used for miners' lamps, inspectors' lamps, dentists' lamps, exit lights, electric

The Tungar Rectifier Bulb.

piano players, burglar alarms, railroad signals, lighting systems of bicycles, motorcycles, motorboats and carriages; ignition systems on automobiles, stationary gas engines and tractors, fire alarms, call bells and buzzers, telephones, etc.

Three sizes of Tungar rectifiers are now being made, all of the half-wave type, with different ampere and voltage capacities, as follows:

The 2-ampere unit, which when perated on 115



Characteristic Curves of Tungar Rectifier.

volts, 60 cycles, will charge three cells at 2 amperes, six cells at about 1 ampere, and eight cells at about 0.75 ampere.

The 6-ampere, 7.5-15-volt unit, for charging either three or six cells of lead battery at 6 amperes when operated on 115-volt, 60-cycle circuit.

The 6-ampere, 7.5-75-volt unit, for charging three to thirty cells of lead battery at from 1 to 6 amperes.

There is practically no installation expense to the purchaser and the rectifiers are very inexpensive to operate, inasmuch as there are no moving parts, and no skilled attendant is necessary to operate them. For charging, the rectifiers need only be connected to a convenient lamp socket and the pair of leads attached to the proper posts on the battery.

For the smallest Tungar rectifier, the maximum limitation is 125 volts, at which it charges with a slight increase in current output; at the minimum of 105 volts, the current output is slightly lower. This small rectifier is amply large to charge a lighting and starting battery, but will take considerably longer to give a completely full charge than the 6-ampere, 15-volt Tungar rectifier.

To put 80 ampere-hours into a 6-volt battery with this rectifier will require 40 hours, but it should be remembered that it does not require anywhere near 80 ampere-hours to give a great many sure starts from the starting motor. An over-night charge of 12 hours will put 24 ampere-hours into a battery at a low rate, which is highly beneficial to the battery. After the battery has been charged at this low rate over night, as soon as the car starts, the generator on the car puts current in at a considerably higher rate (6 to 10 amperes), which will amply take care of requirements during the day. If a complete charge from the rectifier is desired it can be put on the next night, and so on until a long soaking charge has been given. At 10 cents a kilowatt-hour for energy the cost of charging is slightly over 1 cent an hour, including tube-renewal costs. The weight of this small rectifier is about 8 pounds.

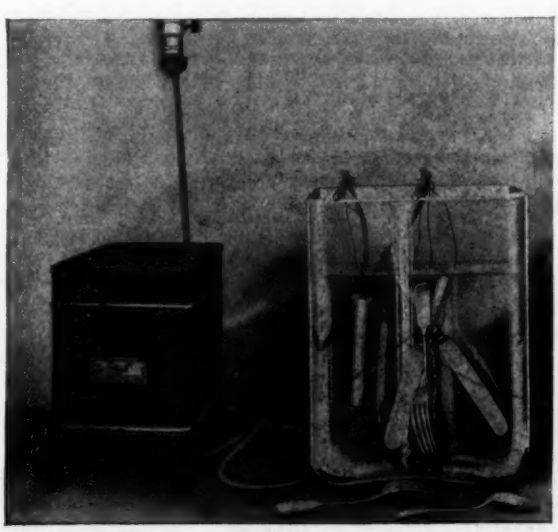
This rectifier is also just the right size for charging ordinary three-cell storage batteries used for motor-driven dental drills and lathes, and for all other small storage batteries where not over 8 cells are used.

The medium-sized Tungar rectifier has a capacity of 6 amperes at 7.5 to 15 volts, and will charge a three-cell or six-cell starting and lighting battery in the home garage in a comparatively short time. In a 12-hour over-night charge it will put 72 ampere-hours into the battery when connected to a 115-volt, 60-cycle circuit, or slightly more when on a 125-volt circuit, and slightly less on 105 volts. The weight is about 15 pounds.

Either the two or the six-ampere rectifier will be found particularly suitable in the winter time when the car is hard to start, taking greater starting current and, consequently, greater strain on the battery, which cannot be made up by the charging of the generator as no long trips are taken and the engine is less frequently used. On account of the fact that low charging current is very good for the battery, whereas very high current (particularly when the battery is nearly full) is harmful to the battery, storage-battery manufacturers are inclined to recommend the smaller or two-ampere Tungar rectifier rather than the six-ampere, but the latter is undoubtedly necessary where quick charging is essential. If properly used, neither one of these rectifiers can injure a storage battery and it is almost impossible to injure a battery by charging it even for days at a time at a two-ampere rate.

Charging is accomplished by connecting the two leads from the rectifier to the storage battery; the red lead on the rectifier goes to the positive pole of the storage battery; the attaching plug is then screwed into the nearest lamp socket, and turning on the switch starts the charge. One can then go away and leave the rectifier, being assured of continuous operation until turned off.

The largest type of the Tungar rectifier is designed for use in public garages and service stations and has a capacity of 6 amperes, 7½ to 75 volts. It will charge from 1 to 10 three-cell storage batteries from a 115-volt, 60-cycle circuit. A compensator with 15 taps is part of the service and a dial switch for instantly adjusting the voltage according to the number of batteries to be charged. The current can be regulated between limits of 1 and 6 amperes. A single three-cell battery may be charged by itself, or any number up to and including 30 cells. The controlling devices, including ammeter, switch and regulating handle, are located on the front of the case.



Tungar Plating Device.

Each Tungar rectifier may be simply mounted on the wall, or bench, when it is convenient to connect it to the 110-115-volt lighting circuit. No special fixtures are required. No attendant is necessary and there is no danger of fire, since no oil or grease is used. There are no moving parts, so no adjusting is necessary. The rectifiers are self-starting, light of weight and require very little room. If the alternating current should be shut off, the batteries cannot be discharged through the rectifier. The device is remarkably efficient so that the cost of battery charging is very low.

Electrically Driven Machine for Polishing, Scrubbing and Sanding Floors.

The "Utility" floor machine, manufactured by the Kent Vacuum Cleaner Company, Inc., Rome, N. Y., is provided with four interchangeable attachments, one for polishing waxed floors, one for scrubbing floors of all types, one for removing varnish, and one for sanding floors. These attachments are a steel wire brush, a palmetto scrubbing brush, a tampico polishing brush and a sandpaper disk. The attachments are circular and are rotated continuously in one direction as the machine propels itself over the floor.

When the operator raises the handle slightly, the machine moves to the right. Lowering the handle causes it to move to the left. Twisting the handle slightly in one direction causes the machine to move forward. Twisting it in the opposite direction causes it to move backward. The weight of the machine is 45 pounds, which causes it to put a pressure on the floor much in excess of that which can be applied by hand. The machine can be operated with ease by maids, scrubwomen, porters or any unskilled help. With 30 minutes' instructions it is claimed that any porter can cover 2000 square feet per hour with this machine. It is claimed that one inexperienced operator with the Utility outfit can do two to five times the amount of work that can be done by hand.

In refinishing hardwood floors, one man using this machine can remove paint, shellac or varnish at the rate of 75 square feet per hour under ordinary conditions, and where the floors are in very bad condition, requiring the removal of a great deal of the finish, a man can clean at the rate of 50 square feet per hour. Floors can be sandpapered at the rate of 100 square feet per hour. Waxed surfaces can be polished at the rate of 2500 square feet per hour and will have a hard, lasting, brilliant finish, not easily marred. This is because the high speed of the brush causes the first coat of wax to heat by friction, melting it into the pores of the wood and thereby acting as a filler. A second light coat can then be polished to a brilliant finish. The results are also claimed to be more uniform than can be obtained by hand, as the pressure and speed of the brush does not vary appreciably.

The Utility machine is practically noiseless in operation and can be used to scrub around beds in hospitals without causing annoyance to the patients. To scrub marble, mosaic, tile and terrazzo floors with the Utility machine, a pure grit powder not costing over 1¼ cents per pound, or sea sand can be used, and it is claimed that the result will be better than by the use of expensive soap and cleaning powders which contain alkali that often burns and discolors the floors. Soaps and cleaning powder are also inclined to make floors slippery, whereas grit powder and sea sand remove all possibility of slipping. To refinish hardwood floors a cheap acid solution can be used with the machine, thus doing away with expensive varnish removers.

Kent Utility Floor Scrubbing and Polishing Machine.

The machine is constructed of metal throughout. The machine frame and motor are practically one unit. The handle is fastened on a toggle joint on the rear of the outside shell. This joint is so arranged that the handle can be adjusted to any height to suit the fancy of the operator. The machine body is made of aluminum, lightness of weight being desired, but durability having been given the first consideration. The handle is made of steel tubing, with the supply cable inside, and the electric current is controlled by a double-pole flush switch set into a switch box at the end of the handle. Ball bearings are used throughout in the machine and motor. Ball-bearing rollers are provided for moving the machine about. These rollers are raised from contact with the floor by a foot trigger when the machine is in use.

The machine is operated by a one-sixth-horsepower, 1750-revolution motor. The speed of the brush is reduced to 200 revolutions per minute through a reduction-gear drive. The motor is completely inclosed and the entire machine is provided with an aluminum case, thus obviating any danger of the revolving part striking and injuring furniture, baseboards, etc., and making it possible to operate the machine against baseboards and close into corners.

The motors used are a special design made for the Kent Vacuum Cleaner Company by the Robbins & Myers Company. They can be furnished for operation on 110 or 220 volts direct current, and for alternating current of 110 or 220 volts and 25, 40 or 60 cycles.

Big Electric Sign.

The accompanying illustration shows the new big electric sign on the roof of Rahe's Auto & Tractor School, Kansas City, Mo. The sign is 171 feet long, 34 feet high, contains 1525 110-volt lamps and is operated by a special motor-driven flasher. More than 7½ tons of steel was used in the construction of the framework. This is one of the biggest signs in the Middle West. It was built by the Thomas Cusack Company, Chicago, Ill. Aside from its size, a specially noteworthy fact about this sign is the solidity of its letters.

Large Electric Roof Sign in Kansas City.

Trade Activities

Many Instructive Bulletins and Circulars Being Issued by Manufacturers

E. W. **Snow & Company,** Rochester, N. Y., with a sales representative at 299 Broadway, New York City, manufacturers of enclosed fuses, last week completed an order for the Government and shipped 13,000 assorted sized fuses for use in Panama Canal work.

Paul Stewart, Inc., Cincinnati, O., dealer in used power apparatus, recently purchased two 600 horsepower B. & W. boilers, having 200 pounds working pressure, 125 degrees superheat. These boilers are complete with stokers and all fittings. The company also has on hand a considerable quantity of other used electrical and steam apparatus and will be glad to send lists to those interested.

Western Electric Company, 500 South Clinton Street, Chicago, is mailing a list of Chicago stock of Western Electric "Habirshaw" wire, solid and stranded, with sizes in single braid and double braid feet given. This wire is of the 600 volt National Electric Code standard. A few sizes of Duplex and Light Fixture wire are also listed. Information on sizes not shown on card will be furnished promptly by communicating with the company.

Vulcan Fuel Economy Company, Chicago, Ill., in an attractive poster being distributed to the trade, calls attention to the fact that there are more than 2,000,000 horsepower in Vulcan soot cleaners in satisfactory service. H. M. Byllesby & Company, Henry L. Doherty & Company, Stone & Webster and the Chicago & Northwestern Railroad have each purchased over 100 of these cleaners. The claim is made that Vulcan cleaners will enable boilers to carry overloads at the same efficiency as the normal load. The company also reports increasing demands for Vulcan "Lastite," an acid, air and waterproof boiler coating that penetrates brick and fills all cracks and holes.

Bacharach Industrial Instrument Company, Pittsburgh, Pa., is distributing catalog D on its Hydro pressure recorders. These instruments are used for pressure and velocity measurements and are built as indicating, recording and combined indicating and recording instruments. Minute pressure changes are indicated; readings of differences in pressure and draft of as low as one thousandth of an inch water gauge are made possible. This is due to the magnification of the readings and the sensitiveness of the instruments. The different types of Hydro recorders are illustrated in the catalog and their various uses for which intended explained. The types are: A—Hydro vacuum or draft gauges; B—Hydro low pressure gauges; C—Hydro vacuum (draft) and pressure (combined) gauges; D—Hydro differential pressure (or draft) gauges; E—Hydro combination pressure recorders; F—Hydro pressure (vacuum) recorder; G—Hydro pressure (vacuum) indicators, and H—Special instruments in conjunction with automatic devices.

Madison Kipp Lubricator Company, Madison, Wis., which has the largest factory in the world devoted to the manufacture of lubricators, is sending out an illustrated catalog on its Madison-Kipp lubricators. This effective and cleverly compiled catalog is composed of five separate, complete booklets, each being distinguished by different colored covers, and the five are collectively placed between loose, adjustable covers, permitting the removal of one or more of the booklets as desired, and still leaving the others securely bound. The first booklet in the group, on Mechanical Construction, clearly describes, illustrates and diagrams, the types, construction and mechanism of the company's lubricators, which may be applied to practically all types of machinery. The second, on Shop Service, deals with shop machinery lubrication. The third, Marine Engine Service, has to do with lubrication of vessel engines, etc., now an important issue. The fourth, Power Plant Service, treats of lubrication of steam engines, internal combustion engines, air compressors, steam pumps, etc. The remaining booklet, Agricultural Service, takes up the lubrication of tractors, threshing machine engines and other farm machinery. The complete catalog is of convenient size for filing.

General Electric Company, Boyd Street, Newark, N. J., has acquired property at 33-55 Seventeenth Avenue, from Boyd to Lillie Street, and is said to be planning for extensions.

Thermo-Electric Regulator Company, Chicago, has sold all its completed thermostatic equipments, stock, dies, etc., as well as an exclusive license to manufacture and sell thermostatic heat regulators under any and all patents now owned by it, or issued on applications pending, to the **Railway Utility Company,** Chicago, manufacturer of the mercury thermostat for electrically regulating the heating current in electric cars.

Electric Furnace Construction Company, Philadelphia, Pa., recently sold a Greaves-Etchells electric furnace to the Ford Motor Works, of Detroit, Mich., which will be used in connection with special Government aircraft work. The company has also just sold two 3-ton furnaces to the Halcomb Steel Company, of Syracuse, N. Y., which will use same for special aeroplane and motor steels.

The Borden Company, Warren, Ohio, has just issued its 1918 Catalog of "Beaver" easy working die stocks and square-end pipe cutters. This catalog is very comprehensive and its attractive appearance indicates that no expense has been spared in securing the services of the best artists and printers. The book is printed in two colors, on high grade paper, and illustrates in a complete and artistic manner the complete line of "Beaver" easy working die stocks and square-end pipe cutters. Several new "Beaver" tools are shown for the first time in this catalog—one of the most popular of these being the new No. 3 "Beaver" junior ratchet die stock, which is built on the unit plan to thread pipe from ⅛ to 1 inch, inclusive.

A. H. Cox & Company, engineers and contractors, and dealing in all kinds of machinery and electric equipment, Seattle, Wash., are now located in larger quarters at 307 First Avenue South, with a frontage on First Avenue of 60 feet and total floor space of seven floors. Yard facilities in the rear for heavy machinery and dockage space on Eyers Dock, gives them facilities for handling heavy shipments by either rail or water. The repair shop facilities have also been increased and the engineering department is prepared to do work along electrical and mechanical lines, handling complete power plants and installations, the latter being made through its construction department, either complete or the department furnishes necessary supervision to carry out projects. Additional help has been employed and in every way improvements have been made to give the most efficient service.

Universal Motor Company, of Oshkosh, Wis., has just completed a two-story, 40x180-foot addition to its plant. The concrete addition has a modern testing department built in with all facilities for testing the marine motors and generating sets, which will handle 15 motors daily. The machine department has been enlarged and many new machine tools, some of special design, have been added. The assembling department has also been enlarged, with improvements in handling devices and equipment. The new plant has enlarged offices, with a most complete sales department under the direction of the company's sales manager, C. J. Pope. The present plant is equipped to make every part of the motor, including castings, all machinery, heat treating, reverse gears, elaborate testing, etc., and, in fact, all parts except screws and drop forgings. The Universal motor is designed to take any form of ignition system, unisparker or magneto, as desired, and where no ignition is specified the unisparker system is supplied. The company is busy with Government work, supplying 4-kilowatt generating sets for portable army work, but with its increased facilities its general trade can also be well taken care of. It issues and furnishes the following bulletins free on request: Bulletin No. 17—Pumping Outfit; No. 18—Stationary Engines; No. 25—Marine Motors, and No. 26—Generating Sets. All of these equipments are powered with the one 4-cycle, 4-cylinder, 2⅝x4 Standard motor.

Men in Service

Louisville, Baltimore and Minneapolis Central Stations Give Out Names of Employees who Have Joined Colors

LOUISVILLE GAS & ELECTRIC COMPANY, Louisville, Ky., reports three of its representatives who went to the Second Officers' Training Camp at Ft. Benjamin Harrison, Ind., have made commissions. Robert Montgomery, manager of the commercial department of the company, has received a first lieutenancy in the infantry, as has also Fulton Mandeville, district sales manager for the company. W. L. Dawkins, formerly in the application department, won a second lieutenancy in the infantry. These three men make 18 out of the employees' force of the company who are now in the service of the country and a large service flag with 18 stars on it has been hung at the main entrance of the company's office building. One of the stars represents Gen. George Harries, president of the company, who is a brigadier general. Donald McDonald, Jr., son of Donald McDonald, vice-president and general manager, won a captaincy in the field artillery. Thomas Leslie Lindell, formerly with the Burdorf-Brecher Company, is another of the Louisville electrical fraternity. He has a first lieutenancy. Some of the men could have had higher commissions but they preferred to take a commission that would assure them immediate assignment to active service.

CONSOLIDATED GAS, ELECTRIC LIGHT & POWER COMPANY, Baltimore, Md., is sending out its November issue of The Baltimore Gas & Electric News with a front cover picture of its service flag. This impressive flag, which bears the numbers 185, hangs over the front door of the Lexington Building in Baltimore, representing its men in either the Army or Navy. Three of this number are now in France, who are Ensign Charles P. Crane, U. S. N.; L. F. Turnbull, Aviation Corps; D. J. McDonald, Hospital Corps. The names and branches of service of those having received promotion are as follows: Naval Militia—Thomas S. Eichelberger, 2nd class electrician; George M. Rogers, oiler; W. Edward Willett, 3rd class yeoman; John E. Murphy, 1st class seaman; Alfred L. Evans, George B. Thuman, Harry J. Henry, Luther M. Larmore and Reginald Hess, 2nd class seamen. Fifty-fourth Depot Brigade, 29th Division—Herbert F. Cover and Joseph C. Dorrell, 1st class privates. 112th Regiment Field Artillery—Leslie D. Hodgkins (transferred from 5th Regiment) cook. 110th Machine Gun Battalion—James S. Fenwick (transferred from 5th Regiment), 1st class private. 104th Military Police, 29th Division—Charles E. Roach, 1st class private. 3rd Motor Truck Company, 104th Ammunition Train—Louis P. Kraft (transferred from 4th Regiment), corporal. Maryland Coast Artillery—Elmer Lee Bonsall, 1st class private. U. S. Naval Reserve Force—Louis E. Elliott, 3rd class electrician. The company has also done more than its share in subscribing and boosting for both issues of the Liberty Loan.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW will *welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

THE MINNEAPOLIS GENERAL ELECTRIC COMPANY, Minneapolis, Minn., has parted with a number of its employees for Government service, and in its house organ, "The Advance," lists the names of 50 employees on its roll of honor, which list is incomplete, as in the same issue the company requests a line on the whereabouts of 14 employees, who also are in service. Classified with reference to department connection with the company, their names, with positions and ranks in the service, are as follows: Accounting—A. L. Bliss, Rockford, Ill.; M. J. Davis, 2nd Officers' Training Camp, Fort Snelling, Minn.; S. S. Hagen, Quartermasters' Department, Fort Benjamin Harrison, Indianapolis, Ind.; W. F. Higi, Dunwoody Navy Board, Minneapolis, Minn.; Jesse Raudenbush, Camp Greene, Truck Company 49, Charlotte, N. C. Auditing—James R. Seitz, Battery B, 337 F. A. Camp Dodge, Iowa. Construction—Homer Ray, Camp Dodge, Des Moines, Iowa. Credit—L. A. Stowell, Quartermasters' Department, Minnesota National Guard, Camp Logan, Houston, Tex.; O. H. Sanaker, Sergeant, Battery C, Camp Dodge, Iowa; Curtis C. Smith, 78th Company, U. S. Marines, Quantico, Va.; Andrew Cavanaugh, 1st Sergeant, Quartermasters' Corps, Camp Logan, Houston, Tex. Engineering—F. L. Chapman, 20th Company, U. S. Marine Corps, 5th Regiment, 8th Battalion, American Expeditionary Forces; H. V. S. Hubbard, 1st Lieutenant, 508th Engineers' Service, Battalion, Camp Pike, Little Rock, Ark.; Carl Nelson, Company C. 313th Engineers, Camp Dodge, Iowa; L. G. Olander, Company A, 313th Engineers, Camp Dodge, Iowa. Electric Operation—E. Carroll, Company 10, 3rd Regiment, Camp Paul Jones, Great Lakes, Ill. Garage—L. E. Chase, Company D, 313th Engineers, Camp Dodge, Iowa. Interior Wiring—William McGowan, Company F, 313th Engineers, Camp Dodge, Iowa. Manufacturing—C. L. Brownell, Headquarters Company, Sixth Regiment, Marines, Quantico, Va.; James A. Colvin, Company E. 313th Engineers, Camp Dodge, Iowa; J. L. Cogan, 1st Lieutenant, 135th Infantry, Camp Cody, N. M. Meter Reader—Albert Roy, Camp Dodge, Iowa; I. Malette, Lieutenant, 1st Minnesota Infantry, Fort Snelling. Operating—Paul Breyer, Company B, No. 110, First Battalion, 313th Engineers, Camp Dodge, Iowa. Overhead Department—Harry Aldredge, Supply Company, 337th F. A., Camp Dodge, Iowa; M. A. Christenson, No. 2,006,547, Engineers' Training Depot, St. John, Quebec; Henry Schultz, U. S. S. Delaware, New York City. Sales—George Getchell, U. S. S. Pennsylvania, New York City; H. G. Smith, Camp Quartermasters' Barracks No. 1, Camp Dodge, Iowa; Harry Heim, 1st Lieutenant, 1st Company Engineers' Officers' Training School, Fort Leavenworth, Kans. Special Construction—Joe Amireault, Battery F, 337 F. A., Camp Dodge, Iowa; William Birmingham, Signal Corps, Washington, D. C.; George Chicken, Company E, 10th Forestry Engineers, American Expeditionary Forces; L. B. Graves, 126th Aero Squadron, Kelly Field, South San Antonio, Tex.; George A. Hult, 2nd Lieutenant Engineers, Camp Dodge, Iowa; William H. Purcell, 1st Lieutenant, Camp Dodge, Iowa; Harry Taylor, Sergeant, 337 F. A., Camp, Dodge, Iowa; F. E. Weddell, 2nd Officers' Training Camp, Fort Snelling, Minn.; Ed. Clement, 2nd Minnesota Artillery, St. Paul Armory; Rinaldo Andrilli, 61st Infantry, Company D, Delage, Mo.; Lincoln Nissley, Jr., somewhere-in-France, Artillery. Warehouse—George Hanna, Battery D, 333 F. A., Building 1153, South Camp Grant, Ill.; C. E. Jodell, U. S. S. Georgia, New York City; Glen Sweet, U. S. S. Georgia, New York City; R. J. Wikan, Regiment 6, Company 79, Marines Corporal, Quantico Va.; W. Quackenbush, U. S. S. South Carolina, New York Bridge Division, New York City; J. P. Christenson, No. 2,006,548, Engineers' Training Depot, St. John, Quebec; John E. Davis, Battery E, 337 F. A., Camp Dodge, Iowa; V. W. Lyon, No. 2,115,489, 14th Draft, C. A. S. C., London, England; Charles B. Reid, 92nd Aero Squadron, Aviation Mobilization, Camp Mineola, Long Island, N. Y.

FRED D. BAKER, formerly new business manager of the Sierra & San Francisco Power Company, and of the Coast Valleys Gas & Electric Company, is now captain in the Quartermasters' Department of the United States Reserves being stationed at Fort MacArthur, California. He is well known in electrical circles on the Coast and was active in many organizations.

Personal

C. H. Lahr Heads Northern Ohio Company—A. D. Baily Promoted—C. E. Elmquist Resigns—Other Changes

GUY HASTINGS has been made manager of Chicago sales for the National X-Ray Reflector Company.

J. C. MANCHESTER, San Francisco, Cal., district sales manager for the Economy Fuse & Manufacturing Company, is now located at 324 Rialto Building.

W. M. FRASER, electrical superintendent of the British Columbia Electric Railway (Ltd.), Vancouver, B. C., now has full charge of the operating end of the business.

F. S. EASTON, hydro-electric engineer of the British Electric Railway (Ltd.), Vancouver, B. C., has been placed in full charge of the power-producing plants of the company.

HARVEY VANCE, for the last eight years borough electrician at Chatham, N. J., has resigned, and will become associated with the Commonwealth Water & Light Company, Summit, N. J.

A. C. CORNELL has been appointed sales manager of the Western Electric Company's branch house at Denver, Colo. Prior to this promotion he was house-goods specialist in the St. Louis office of the company.

CHARLES BULKLEY HUBBELL, a New York City attorney, will be appointed by Governor Whitman to the Public Service Commission for the First District of New York to succeed William Haywood, now in Government service.

G. H. KELSAY has been made electrical engineer of the Union Traction Company of Indiana, Anderson, Ind. He is now in charge of overhead lines, lighting and power circuits and sub stations. Prior to this promotion he was superintendent of power for the company.

WILLIAM J. HARDAKER, Reading, Pa., has been appointed general superintendent of the Reading Transit & Light Company and the Metropolitan-Edison Electric Company interests in Lebanon County. Mr. Hardaker has been associated with the Reading Company for the last 25 years.

W. F. TRENARY, JR., with headquarters at 419 Brown-Marx Building, Birmingham, Ala., now represents the Harrison Safety Boiler Works, of Philadelphia, manufacturer of the Cochrane heaters and other steam plant appliances. He succeeds W. R. Jennison, whose connection with that company has terminated.

JAMES SWEENEY has been appointed auditor of the Northern Ohio Traction & Light Company, Akron, Ohio, succeeding Charles H. Lahr, promoted to the office of secretary. Mr. Sweeney began his business career as a clerk in the accounting department of this company 11 years ago and for the last five years has been chief accountant. George Wherley succeeds him in the latter position.

GEORGE LESLEY has been appointed manager of the Iowa Electric Company at Oxford Junction, Iowa, to succeed J. G. Jensen, resigned.

E. A. Fox has been appointed superintendent of electrical distribution of the Charleston Consolidated Railway & Lighting Company, Charleston, S. C.

G. H. WALBRIDGE has resigned as president of the Colorado Power Company, Denver, and has been elected chairman of the board of directors. L. P. Hammond, formerly vice-president and general manager, has been elected president. O. B. Willcox, of Bonbright & Company, has been elected vice-president to fill the vacancy created by Mr. Hammond's promotion.

J. W. WHITE has been appointed manager of the Westinghouse Electric & Manufacturing Company's Power and Railway Divisions at Detroit, Mich. He formerly was connected with the Pittsburgh office of the Westinghouse company, subsequently becoming associated with the Allis-Chalmers Company and now has returned to the Westinghouse fold, assuming the above position.

FRED M. ROSSELAND, until recently safety inspector for the Chicago Telephone Company, has accepted the position of safety engineer for the National Safety Council, with headquarters at Chicago. Mr. Rosseland is well known in electrical circles in Chicago, having served as secretary and also as chairman of various committees for the Electric Club Jovian League. Previous to his connection with the Chicago Telephone Company Mr. Rosseland was a representative of the General Electric Company at Chicago.

FRED W. PUTNAM, of Green & Putnam, lawyers of Red Wing, Minn., has been appointed a member of the Minnesota Railroad & Warehouse Commission by Governor J. A. A. Burnquist. He succeeds Charles E. Elmquist, who has assumed new duties at Washington, D. C. Mr. Putnam, who is a graduate of the University of Minnesota, studied law at the University of Michigan, from which he was graduated in 1909. He first entered the office of Attorney General George T. Simpson, and later was with the law firm of Keith, Evans, Thompson & Fairchild.

A. D. BAILEY, who for the last eight years has been assistant engineer of the Commonwealth Edison Company's station one and later stations one and two, at Fisk Street and Quarry Street, has been appointed chief engineer of those stations. He succeeds Olaf E. Oleson, who is now president and general manager of the Edwards Valve & Manufacturing Company of East Chicago, Ind. Mr. Bailey entered the company's service in 1903, as assistant to the chief at Harrison Street station. In 1905 he entered the drafting room of the Engineering Department. From there he went to Fisk Street in 1906 as assistant to Mr. Oleson. In January, 1910, Mr. Bailey was given the title of assistant engineer of stations one and two.

CHARLES E. ELMQUIST has severed his connections with the Minnesota Railroad & Warehouse Commission after nine years' service. He has gone to Washington, D. C., to assume his new duties as solicitor for the valuation bureau maintained at the capitol by the National Association of Railroad & Utility Commissioners. In his new field he will represent the public side in any controversy that may arise over policies and methods of railroad valuation.

W. C. KAMMERER has joined forces with the National Carbon Company, Cleveland, Ohio. He formerly was mechanical engineer with the Texas Company, Port Arthur, Tex.

CHARLES H. LAHR has been elected secretary of the Northern Ohio Traction & Light Company, Akron, Ohio, succeeding F. C. Potvin, resigned. Mr. Lahr is the only person now connected with the Akron Company who has been continuously in the service for over 25 years. At the time he began work for the old Akron Street Railway Company, in 1892, he was the only office employee engaged. His title was cashier and he also kept the books and looked after all of the office work. In 1897 the Akron Street Railway Company and the Akron Electric Light Company were consolidated under the name of the Akron Street Railway & Illuminating Company, and Mr. Lahr served in the capacity of cashier and bookkeeper. In 1899 this company went into the hands of receivers and he continued in the same capacity. In 1901 the Everett-Moore syndicate purchased the property at sheriff's sale, retaining Mr. Lahr in his old position. In 1906 the company purchased the Cuyahoga Falls Rapid Transit Company, merged it with the Northern Ohio and reincorporated as the Northern Ohio Traction & Light Company. At this time Mr. Lahr was appointed auditor of the company, which office he retained until elected secretary November 8, 1917. In December, 1916, the property passed under the control of Hodenpyl, Hardy & Company, New York, who are now operating it. One hundred and fifty people are now employed in the department in which Mr. Lahr began as the only employee.

Obituary.

CHARLES EDWARD BROWN, treasurer of the Washington Railway & Electric Company and the Potomac Electric Power Company, Washington, D. C., died November 9, at the age of 44. He had been treasurer of the above companies since 1910 and had been connected with electric railroads and power companies the greater part of his life.

Current News

Weekly Record of Construction Activities—Record of Electrical Patents Issued November 13

EASTERN.

RUTLAND, VT.—Rutland Railway, Light & Power Company has been granted permission by the Public Service Commission to increase the fares in each zone of its electric railway system from five to six cents, which will increase the gross revenue of the company about $25,000 annually.

NEWPORT, R. I.—The United States Government, Navy Department, Bureau of Yards and Docks, has awarded a contract for the construction of its proposed one-story power plant at the local navy yards, which, in connection with another structure to be erected, will cost approximately $900,000. The Westinghouse, Church, Kerr Company, 37 Wall street, New York, is the contractor.

WATERBURY, CONN. — Connecticut Light & Power Company, 111 West Main street, is making rapid progress in the construction of its new power house and dam at Stevenson. J. A. P. Crisfield Contracting Company, N. W. corner Broad and Arch streets, Philadelphia, Pa., is the contractor.

BINGHAMTON, N. Y.—Binghamton Gas Works, Court street, will build a one-story power house, about 30x35 feet, at its works. Contract has been awarded to S. B. Price, Blanchard avenue, Binghamton.

BINGHAMTON, N. Y.—Binghamton Light, Heat & Power Company is making rapid progress in the construction of the addition to its power house. The company has perfected arrangements for securing the right-of-way to provide for the extension of its lines to the plant of the Hires Condensed Milk Company, and construction work will be commenced within the next week. It is expected to have a total connected load of 250 horsepower on these lines by January 1.

EAST UTICA, N. Y.—Utica Gas & Electric Company, Washington street, has awarded a contract for the construction of a one-story substation about 35x57 feet, to cost $12,000.

MACEDON, N. Y.—Town Board will buy an electric light plant owned by a private company. Improvements are being made.

NEW YORK, N. Y.—Single Service Packing Company of America, 326 Hudson street, has awarded a contract to Michael Doherty, 13 Rose street, New Rochelle, for the construction of a one-story power house on the Saw Mill River Road, Yonkers, which, in connection with another building to be erected, will cost about $30,000.

NEW PALTZ, N. Y.—Until December 17, bids will be received by Dr. Thomas E. Finegan, Deputy Commission of Education, Education Building, Albany, N. Y., for electrical work in connection with the addition to the local State Normal School.

SYRACUSE, N. Y.—Board of Education is planning for the construction of a heating plant at the McKinley School. Henry C. Allen, city engineer.

BAYONNE, N. J.—Bayonne Steel Casting Company, Oak street and Ingham avenue, has taken out a building permit for the construction of a one-story brick substation at its plant.

HIGHTSTOWN, N. J.—Council is planning for the installation of new equipment at the pumping station at the waterworks, to provide for increased capacity.

JERSEY CITY, N. J.—City has awarded a contract to W. H. & F. W. Cane, Woolworth Building, New York, for alterations and additions at the power house at the city hospital.

JERSEY CITY, N. J.—Browns Mills Electric Light & Power Company has incorporated with a capital of $50,000. It will operate a plant to generate and distribute electricity. The incorporators are C. H. Jarvis, J. Haviland Tompkins and John R. Turner.

LODI, N. J.—Town Council is having plans prepared for the construction of a brick pumping station at the waterworks. Thomas F. Rowe, East Rutherford, is the architect.

NEWARK, N. J.—Butterworth-Judson Company, Avenue R, has taken out a building permit for the construction of a one-story power plant addition at its works to cost about $15,000.

NEWARK, N. J.—Board of Education is having plans prepared for the construction of a one-story boiler plant at the Alexander street school to cost about $16,000.

NEW BRUNSWICK, N. J.—Until December 3, the County Building Committee will receive bids for the installation of new electric-lighting fixtures in the county jail. Anthony J. Gebhardt, Committeeman.

NEWTON, N. J.—Town Council has awarded a contract to the Newton Electric & Gas Company for furnishing service for street lighting, at a price of $7,814. The contract is for a period of one year, effective January 1, 1918.

PLEASANTVILLE, N. J.—Atlantic City Suburban Gas & Fuel Company will take over and operate the electric and gas plants of the Pleasantville Heat, Light & Power Company. Permission has been received from the Board of Public Utility Commissioners.

RIVERTON, N. J.—Board of Public Utility Commissioners has granted permission to the Riverton & Palmyra Water Company to issue stock to the amount of $25,000 to provide for additions and improvements in its plant and system.

TRENTON, N. J.—Delion Tire & Rubber Company, Whitehouse Road, has awarded a contract for the construction of a two-story power house addition to its plant, about 35x55 feet. J. H. Morris, Broad Street Bank Building, Trenton, is the contractor.

ALLENTOWN, PA.—Industrial Electric Light & Power Company of Upper Millford has incorporated with a capital of $5000. Charles M. Wagner is the principal incorporator.

BENSON, PA.—Borough Council has made application to the Public Service Commission for permission to operate a municipal electric light plant.

BETHLEHEM, PA.—Bethlehem Silk Company, 15 Goepp street, is making arrangements for the complete electrification to its plant.

COATESVILLE, PA.—Chester Valley Electric Company has filed notice of a bond issue for $45,000 to provide for extensions, improvements, etc.

ERIE, PA.—Erie County Electric Company, French and East Twelfth streets, has commenced the construction of a one-story substation, about 45x60 feet, on Walnut street, between Eleventh and Twelfth streets, to cost $6000. The Constable Brothers Company, Fifth and Sassafras streets, Erie, has the contract for erection.

HARRISBURG, PA.—Governor Brumbaugh has approved the merger of seven electric companies chartered for Dauphin, Perry and Juniata counties into the Juniata Public Service Company of Clearfield. The company, which will have a capital of $346,000, will operate from Millersburg.

LANCASTER, PA.—Conestoga Traction Company has commenced the installation of new equipment in its Engleside power plant. The company is planning for extensive improvements, for the most part in new electrical equipment, to cost approximately $100,000.

LANSDOWNE, PA.—Springfield Consolidated Water Company has awarded a contract for the erection of a one-story brick, steel and stone addition to its pumping station near Phoenixville, about 25x55 feet, to cost $12,000. The Wark-Yardley Company, 1737 Filbert street, Philadelphia, has the contract for construction.

PHILADELPHIA, PA.—John Williams Manufacturing Company, Twelfth and Carpenter streets, has awarded a contract for alterations and improvements in its power house to cost about $5000. The Frick Grate & Bar Company, 421 Chestnut street, Philadelphia, is the contractor.

PHILADELPHIA, PA.—DeLong Hook & Eye Company, Broad and Wallace streets, has awarded a contract for the construction of a one-story power house and factory building at Twenty-first and Clearfield streets. The entire work is estimated to cost $250,000. W. Steele & Son, 30 South Fifteenth street, Philadelphia, are the contractors.

READING, PA.—D. J. Driscoll is having plans prepared for the installation of an electric smelting system in the foundry now in course of construction at Hamburg. The new system will be utilized for the production of ingots.

SUNBURY, PA.—Borough Council is having preliminary plans prepared for the construction of a municipal electric lighting plant.

TROY, PA.—John Wildi Evaporated Milk Company has awarded a contract for the construction of an addition to its power plant. Pulford & Pompsey, 157 Falck street, Elmira, N. Y., are the contractors.

ANNAPOLIS, MD.—United States Government, Bureau of Yards and Docks, is having plans prepared for extensions to its electric power, water and heating systems at the naval academy. The entire work is estimated to cost $500,000. F. R. Harris is chief.

BALTIMORE, MD. — Chesapeake & Potomac Telephone Company, Light Street, is having plans prepared for the construction of a telephone exchange plant at Belair. McKenzie, Voorhees & Gmelin, 1123 Broadway, New York, are the architects.

CHARLESTON, W. VA.—United States Government, Bureau of Yards and Docks, has awarded a contract for the construction of an electric power distributing system at the naval projectile plant. L. K. Comstock Company, 30 Church street, New York, is the contractor. The work will cost $13,500.

HUNTINGTON, W. VA.—McKinley Storage Battery Company has incorporated to operate service battery stations, with a capital of $5000. The incorporators are T. J. McKinley, W. R. Power, C. W. Marcum, J. O. Marcum and H. S. Newton.

ST. ALBANS, W. VA.—St. Albans Electric Manufacturing & Supply Company has incorporated with a capital of $50,000. The company will manufacture electrical fixtures and supplies. C. A. Zerkle, H. W. Gonla and L. J. White are incorporators.

BURLINGTON, N. C.—Piedmont Railway & Electric Company has filed notice of an increase in its capitalization to $1,000,000, and will change its corporate name to the Piedmont Power & Light Company.

LAWTON, N. C.—Council is planning ways and means to secure electric lighting.

BURLINGTON, S. C.—Piedmont Railway & Electric Light Company has been reorganized. Improvements and extensions will be made.

JACKSONVILLE, FLA.—Florida Metal Products Company is in need of electric motors.

GAINESVILLE, FLA.—East Florida Telephone Company is planning for extensions in its system from Trenton, Alachua County, to Chiefland, Levy County.

NEW PORT RICHEY, FLA.—Richey Construction Corporation, recently incorporated with a capital of $50,000, has acquired a privately-owned local electric

light plant, and is planning for extensions to furnish service for street lighting in the central part of the city. The company is also planning a later installation of alternating current 2200-volt three-phase system.

PENSACOLA, FLA.—Pensacola Electric Company will spend $75,000 for railway improvements. Address T. J. Hanlon, Jr., manager.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—United States Government has awarded a contract to the National Concrete Construction Company, Louisville, for the construction of a power house at Lock No. 41, Ohio River.

DALLAS, TEX.—Further announcement of the plans of the Dallas Power & Light Company for improving and extending its system in Dallas have been made by W. B. Head, vice-president of the company. He stated that four new electric power substations will be built for the distribution of power. One of these will be located near the new interurban station and will cost $575,000. A second substation will be constructed in Oak Cliff at a cost of $177,400, a third will be built on Peak street at a cost of $181,300 and another one will be built in East Dallas, but its proposed cost has not yet been determined. Besides these improvements the laying of conduits under ground call for an expenditure of $918,200. The plans provide that extensions and improvements to the power generating transmission facilities shall be made at a cost of $729,000. The improvements to the overhead system, including street lighting, will cost an additional $253,600. The total proposed expenditures as mapped out up to this time amount to approximately $2,834,-500.

DALLAS, TEX.—The power transmission lines of the Dallas Power & Light Company and the Texas Power & Light Company will be connected at Norwood and Trinity Heights, in order to insure an adequate supply of electric power in the evening hours. This plant, according to F. R. Slater, vice-president and general manager of the Texas Power & Light Company, will entail the construction of a 7-mile high power transmission line costing approximately $250,000.

HOUSTON, TEX.—Petroleum Refining Company will build a large machine shop, carpenter shop and install a steam plant in connection with its new oil refinery, which it is constructing here. The refinery will cost about $1,000,000 and will have a daily capacity of 15,000 barrels. The oil upon delivery at the plant through a system of pipe lines will be electrically pumped into steel tanks of the latest type.

SAN ANGELO, TEX.—San Angelo Water, Light & Power Company has adopted plans for the construction of a reinforced concrete dam across the South Concho River, a few miles south of here, for the purpose of increasing the water supply of the city. The dam will be approximately 225 feet long, 15 feet high above low water mark, 10 feet wide at the base and 4 feet wide at the top. The company will also install additional machinery in its water, light and power plant.

NORTH CENTRAL STATES.

CINCINNATI, OHIO.—Standish Electric Company has incorporated with a capital of $10,000; P. H. Standish, John E. Devere, G. B. Jolly, H. B. Street and H. F. Gravenkemper.

CLEVELAND, OHIO.—An addition to cost $700,000 will be erected to the lighting plant here. Switchboard, generators, boilers, dynamos, pulleys, etc., will also be installed. Address Lighting Commission, City Hall.

CLEVELAND, OHIO.—Pennsylvania Railroad has bought property at East Fifty-fifth street for a terminal. Two electric cranes will be purchased for the handling of freight. Address R. K. Rochester, Superintendent of the Cleveland Division.

COLUMBUS, OHIO.—Architect Joseph N. Bradford, Ohio State University, has begun the preparation of plans for six large agricultural buildings to be erected on the campus west of the Olentangy River. The group will include a number of barns and administration buildings and a power plant.

DATES AHEAD.

American Society of Mechanical Engineers. Annual meeting, New York City, December 4-7. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

American Institute of Consulting Engineers, Inc. Annual meeting, January 14. Secretary, F. A. Molitor, 35 Nassau Street, New York City.

Electrical Contractors' Association of State of Missouri. Annual convention, January 19. Secretary, A. J. Burns, 318 West Tenth Street, Kansas City, Mo.

Minnesota Electrical Contractors' Association. Annual convention, Minneapolis, Minn., January 20. Secretary, G. M. Jones, 112 South Seventh Street, Minneapolis.

Western Association of Electrical Inspectors. Annual meeting, Memphis, Tenn., January 29-30-31. Secretary, W. S. Boyd, 175 West Jackson Blvd., Chicago, Ill.

Illinois Electrical Contractors' Association. Semi-annual convention, Chicago, February, 1918. Secretary-Treasurer, L. B. Van Nuys, 238 South Jefferson Avenue, Peoria, Ill.

COLUMBUS, OHIO.—Empire Gas & Fuel Company, of which Columbia Gas & Electric Company owns 51 per cent of the capital stock, has increased its capital from $1000 to $1,000,000.

COLUMBUS, OHIO.—Columbus Railway Power & Light Company has asked permission to issue $276,500 of preferred stock and $1,000,000 worth of bonds to pay for extensions and improvements. The bonds are to be sold at 90 or better, or pledged at not less than 80.

DANBURY, OHIO.—Northwestern Ohio Railway & Power Company's proposition to the New York Central lines to supply the latter's large pumping station, about one and one-half miles west of Ranbury Stop, has been accepted. The Northwestern is to build the entire line from its line at Danbury Stop to Danbury and place an additional transformer to serve same. The New York Central is to pay the entire cost of building the line, also cost of one-third wire from Danbury Stop to Danbury and one-half the cost of the transformer. There will be no refund to the New York Central on this proposition. The line from Danbury to the New York Central's pumping station is to become its property and the transformer and wire to Danbury to remain the property of the Northwestern.

EAST LIVERPOOL, OHIO.—Steubenville, East Liverpool & Beaver Valley Traction Company has incorporated with a capital of $4,000,000 to build a traction line connecting Steubenville with Pennsylvania cities. Address J. H. Maxell and G. H. Faulk, Park Boulevard, East Liverpool.

MANSFIELD, OHIO.—Mansfield Electric & Manufacturing Company, a subsidiary of the Central Ohio Gas & Electric Company, which in turn is controlled by the Cities Service Company, has completed arrangements which have been pending to acquire the property and franchises of the Mansfield Railway, Light & Power Company. Application to consolidate the two properties has been filed with the Ohio Public Utilities Commission.

YOUNGSTOWN, OHIO.—Youngstown Board of Education is formulating a plan for the erection of school buildings to cost $300,000. At election Nov. 6 Youngstown voters authorized an additional levy for all school purposes of one mill, adding $180,000 to the funds available.

GREENBURG, IND.—Decatur County has appropriated $1000 to place pedestal lights about the public square.

NEWTON, IND.—Newton Electric Light Company has incorporated with a capital of $10,000, to produce light, heat and power. James R. Campbell, Thomas Schultz and others are incorporators.

CHAMPAIGN, ILL.—Urbana & Champaign Railway, Gas & Electric Company has increased its capital from $700,000 to $900,000. Address William B. McKinley, manager.

CHICAGO, ILL.—Electrical Machinery Sales Company, 327 South La Salle street, has increased its capital from $5000 to $25,000.

CHICAGO, ILL.—Illinois Light & Power Company has filed a petition with the state public utilities commission asking for authority to issue mortgage bonds to the amount of $500,000. Address Secretary, 1301-105 South La Salle street, Chicago.

DECATUR, ILL.—Decatur Railway & Light Company has increased its capital from $1,375,000 to $1,600,000.

EVANSTON, ILL.—Excavating for a station house, 50x25 feet, for the Chicago, North Shore & Milwaukee electric road has been started. The station will be built with latest features and follows most modern plans. The cost of the building is estimated at from $5000 to $8000.

IRON RIVER, MICH.—Iron River Stamnough & Crystal Falls Street Railway contemplates erecting a power house and a car barn.

KAUKAUNA, WIS.—Kaukauna Electric Light Company will extend its transmission lines of the electric light department to Fairview Heights, the new addition of Little Chute.

MANITOWOC, WIS.—Wisconsin Public Service Company, through Clement C. Smith, its president, has filed acceptance of the provisions of the new franchise under which the company will be permitted to enter the city to engage in the sale of power.

GARNER, IA.—Iowa Falls Electric Company's plant here was damaged to the extent of $10,000 recently, owing to spontaneous combustion in a pile of coal stored at the plant.

MORNING SUN, IA.—City is voting on a proposed electric lighting franchise for 24-hour service. D. D. Bentzinger, of the Burlington Railway & Light Company, of Burlington, in asking for the franchise stated his company intended to run its power line north from Burlington, connecting up Mediapolis, Morning Sun, Wapello and Winfield, giving each city a full day electric service.

VAIL, IA.—Petition is being circulated asking for election to vote on bond issue for electric transmission line from Vail to Bannison.

LIBERAL, KANS.—Liberal Light, Ice & Power Company's properties have been acquired by the Commonwealth Light & Power Company. The properties consist of an electric light plant operated by Deisel engines and a 15-ton ice plant.

TIPTON, KANS.—City has bought electric light plant from Barber-James-Dwinnell Electric & Manufacturing Company, of Topeka, and installed 24-hour service here.

LINWOOD, NEB.—Stava & Franklin Electric Company's plant has been acquired by William Lowman.

FARGO, N. D.—General Gas & Electric Plant Company has incorporated for $25,000, by Fred Schulze, A. L. Costello, Herman Rabe and George Berzel. The company will manufacture and install gas and electric plants and manufacture and sell gas and electricity for light and power, with Fargo as its home office.

LAVERNE, OKLA.—City will vote on question of issuing $13,000 bonds with which to buy the Laverne Light, Power & Ice Company's property. The plant will be extended and improved.

WESTERN STATES.

GREAT FALLS, MONT.—Montana Power Company is considering construction of a substation in the downtown section, which will cost about $150,000.

HARLEM, MONT.—Council has accepted the bid of the Electric Construction Company for the installation of an ornamental lighting system. The work will cost $4340. If the necessary underground cable can be had the work of installing these lights will be started within a short time.

HOT SPRINGS, MONT.—It is reported that Conrad Smith and F. E. Campbell will erect a power plant at this place.

PLEVNA, MONT.—Stater Bros., of Baker, are considering the installation of an electric light and power plant.

Electrical Patents Issued November 13, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,246,037. Permutation-Lock for Electric Switches. T. Barnes, Charlton, Iowa. Structural details.

1,246,038. Protective Means for Electrical Distribution Systems. D. Basch, assignor to General Electric Co. Relates to the association of the tripping means for disconnecting switches at the ends of a cable section in the line.

1,246,042. Flash-Light. B. Benedict, assignor to Beacon Miniature Electric Co., Inc., New York, N. Y. Structure of portable battery device.

1,246,047. Electric-Lighting Fixture. C. A. Brown and A. M. Klingman, assignors to General Electric Co. Structure of frame and glass enclosure for a lamp.

1,246,054. Inclosed-Arc Device. J. H. Clough, assignor to General Electric Co. A sealed envelope contains an incandescent cathode, and anode of calcium and a filling or argon.

1,246,056. Electrical System. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Relates to the control of an electric starting motor for an engine.

1,246,057. Starting Mechanism for Automobiles. F. Conrad and C. E. Wilson, assignors to Westinghouse Electric & Mfg. Co. Control and gearing of electric motor.

1,246,065. Process for the Manufacture of Heating Elements for Thermic Telephones. P. de Lange and R. A. B. van Lynden, assignors to Naamlooze Vennootschap De Nederlandsche Thermo-Telephoon Maatschappij, Utrecht, Netherlands. The elements are made from Wollastone wires.

1,246,066. X-Ray Device. L. E. Dempster, assignor to General Electric Co. Has special focusing means for the cathode rays.

1,246,080. Illuminated Switch Button. M. C. Frank, Piedmont, Cal. Luminous substance covered by transparent material, is embedded in button.

1,246,083. Electroplating. H. N. Gilbert, assignor to American Optical Co., Southbridge, Mass. Has special arrangement for stirring the electrolyte.

1,246,088. Overflow Release Means. C. L. Goodrum, assignor to Western E.ectric Co. A connecting switch in a telephone system, has the circuit of its release magnet closed when the contacts of the last line are reached, if that line is busy.

1,246,093. Headlight for Vehicles. C. E. Harthan, assignor to General Electric Co. Structure of non-glare glass.

1,246,102. Junction-Box Connector. M. Janofsky, assignor to Winner Mfg. Co., Washington, D. C. For securing a cable to a junction box.

1,246,105. Refillable Cartridge-Fuse. O. H. Jung, assignor to Arrow Fuse & Mfg. Co., Milwaukee, Wis. Details of construction.

1,246,106. Electric Welding System. A. D. Keene, assignor to General Electric Co. The tripping of a circuit breaker is controlled by the voltage across a rheostat in the work circuit.

1,246,107. Supp rt for Electrical Fixtures. J. H. Kendig, Pittsburgh, Pa. Bracket for supporting fixtures on a wall.

1,246,118. Incandescent Lamp. I. Langmuir, assignor to General Electric Co. Has a specially shaped bulb whereby mercury vaporized in the bu.b is swept against filament to carry away deleterious gases which may be developed.

1,246,125. Automatic Telephone Exchange System. A. E. Lundell, assignor to Western Electric Co. Has means for automatically connecting in a telephone set when a connecting circuit is connected with a calling line, and cutting it out only upon completion of the connection to a certain line.

1,246,126. Call-Recording System. A. E. Lundell, assignor to Western Electric Co. For manual telephone system.

1,246,128. Ignition Mechanism. A. G. McCaleb, assignor to Webster Electric Co. Make and break electrodes are operated in synchronism with a magneto.

1,246,137. Headlight-Dimmer. P. Miller, Bridgeport, Ohio. Shutter arrangement.

1,246,139. Overhead Transportation System. J. F. Montine, Nevinville, Iowa. Telephone system.

1,246,156. Starting and Lighting Unit. F. B. Rae, Cleveland, Ohio. Structure and gearing of motor-generator set.

1,246,165. Electrical Resistance Material. C. Ruzicka, Gravesend, England. A mixture of boron carbid, iron carbid and feldspar.

1,246,171. Electrical Apparatus. F. Sieber, assignor to General Electric Co. Where leads from a winding pass through magnetic material, the magnetic material between the leads is surrounded by a short-circuited winding.

1,246,176. Machine-Switching Telephone Exchange System. A. B. Sperry, assignor to Western Electric Co. Grouping of finder switches and lines.

1,246,201. Telephone Toll Device and Circuits Therefor. S. B. Williams, Jr., assignor to Western Electric Co. Comprises a register, and discriminating means controlled by the operator for operating it.

1,246,205. Starting Mechanism for Automobiles. C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. Gearing is controlled through a longitudinally shiftable motor armature.

1,246,206 and 1,246,207. Starting Mechanism for Automobiles. C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. Modifications of above.

1,246,216. Headlight-Lens. W. H. Zorger, Champaign, Ill. Non-glare structure.

1,246,225. Portable Electric Light. B. Benedict, assignor to National Carbon Co., Inc., New York, N. Y. Structure of flash light.

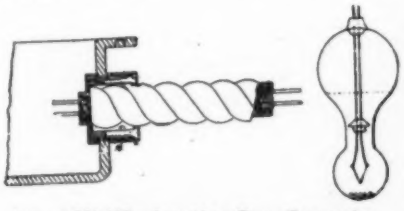
1,246,238. Means for Operating a Movable Member in a Mechanism by a Passing Body. H. A. Cox and G. E. Lloyd, Sutton, and H. E. Osborne, London, England. The passing body comprises a cam forming the poles of an electromagnet and a cam pin in the mechanism is its armature.

1,246,247. Electric Air-Medicator (Capillary-Action Type). F. C. Dorment, assignor to Volto Co., Cleveland, Ohio. Interior of inhaler is heated by an electric bulb.

1,246,257. Electromagnetic Brake. G. G. Gelt, Boston, Mass. Operates by traction on the rails and formation of eddy currents in the wheels.

1,246,282. Electrical Switch. F. T. Kobayashi, Kenilworth, Utah. Pull operated; for mounting in husk of fixture.

1,246,288. Switch-Box. A. Lindner, assignor to Ram Engineering Co., Columbus, Ohio. Detachable key-operated structure for attachment to face of switch.



No. 1,246,102—Junction-Box Connector.
No. 1,246,118—Mercury-Tungsten Lamp.

1,246,303. High-Tension Line-Switch. E. A. Muckey, assignor one-half to E. W. Beardsley, San Francisco, Cal. Details of structure having movable contacts on a rock shaft.

1,246,304. Support for Electric Conductors. O. Mueller, and W. D. Hamer, assignors to Electric Service Supplies Co., Philadelphia, Pa. Structure of cross-arm.

1,246,308. Process of Manufacturing Electric Measuring Instruments. E. Neubaur, assignor to Aron Elecktricitatszahlerfabrik G. M. B. H., Charlottenburg, near Berlin, Germany. Manner of securing a disk to a shaft.

1,246,312. Intensifier for Magnetos. N. Ostenberg and P. Ostenberg, San Jose, Cal. Centrifugally contro led detents and flexible driving connection.

1,246,317. Telephone Apparatus. S. C. Porter, assignor to Port-O-Phone Corp., Esopus, N. Y. Horn for attachment to a telephone receiver.

1,246,325. Cable-Clamp. G. E. Rohmer, assignor to Booraem & Rohmer Patent Co. Details of sheet metal structure.

1,246,330. Mechanism for Operating Brakes, Clutches, and the Like. A. C. Sargent, Des Moines, Iowa. A motor is operated in either direction and for the desired distance by a commutator operated by levers on an automobile steering wheel.

1,246,333. Fitting for Conduits for Electrical Conductors. A. W. Sclater, Westminster, London, England. For connecting conduit ends.

1,246,338. Illuminated Transparent Retractor. I. J. Smith, Chicago, Ill. Arrangement of battery lamp.

1,246,339. Self-Illuminating Depresser for Dental and Surgical Work. I. J. Smit, Chicago, Ill. Comprises lamp supplied through cord.

1,246,340. Self-Illuminated Surgical Illuminating-Speculum. I. J. Smit. Structure having battery lamp.

1,246,358. Distributing-Machine. A. S. Trew, Portland, Oreg. Key-controlled, electromagnetically operated, machine for distributing cards and letters.

1,246,362. Call-Answering Meter for Cord Circuits. R. I. Utter, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. One meter suffices for several link circuits and is automatically operated on insertion of answering jack if condition of line is suitable.

1,246,363. Magnet-Switch. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Closing of switch requires a certain sequence of changes of energization in the magnet.

1,246,376. Spark-Plug. G. Anger, McKees Rocks, Pa. Structural details.

1,246,380. Circuit-Interrupter. H. G. Baxter, assignor to Westinghouse Electric & Mfg. Co. Structure of contacts.

1,246,384. Automatically-Operated Railroad-Gate. W. C. Biggins and W. H. Biggins, Diamond, Ind. Is operated by a train-carried power source through a third rail.

1,246,414. Spark-Plug. P. T. Gautier, St. Louis, Mo. Details of construction.

1,246,417. Inclosed Fuse. E. H. Gilbert, assignor to Westinghouse Electric & Mfg. Co. Removable fuse carrier within the casing has a reduced section of paper which is ruptured when fuse blows.

1,246,420. High-Power Transmitting Apparatus for Wireless Telephones. P. J. Hackett, Seattle, Wash. Has arrangement of condensers to increase the capacity of an audible sound.

1,246,421. Control System. A. J. Hall, assignor to Westinghouse Electric & Mfg. Co. For two similar sets of induction motors for driving a railway car or other common load.

1,246,422. Circuit-Closer. G. M. Hart, Wilkes-Barre, Pa., and L. L. Evans, Bridgeport, Conn. Contact structure.

1,246,423. System and Method of Control. R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. For alternating motor of commutator type.

1,246,424 and 1,246,425. System of Control. R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. Relate to the arrangement and control of armature windings of railway motors.

1,246,426. Power-Transmission Mechanism. H. F. Herman, assignor to Imperial Piano Player Co. Arrangement of electromagnet having a continuously revolvable armature for operating piano players.

1,246,429. Microphone-Transmitter. J. E. B. Holladay, assignor to Holladay Detecto Co., Inc., Suffolk, Va. The diaphragm electrode carries a coil.

1,246,430. Relay. R. M. Hopkins and J. F. D. Hoge, assignors to American District Telegraph Co., Jersey City, N. J. Structure of delicate device for making good contact.

1,246,433. Circuit-Closer for Burglar Alarms. J. Kellogg, assigner one-half to S. Speight, Little Falls, N. J. For mounting on a star tread.

1,246,441. Metallic Terminal for Electrodes. G. M. Little, assignor to Westinghouse Electric & Mfg. Co. For making connection with the embedded core of an arc-light electrode.

1,246,461. Strain-Insulator. B. A. Plimpton, Victor, N. Y. The sections of a chain

type structure have separable locking members.

1,246,470. **Barrier-Seal.** E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. For a mercury vapor device.

1,246,471. **Automatic Burglar and Fire Alarm.** J. P. Rumpf, Baltimore, Md. Details of circuit closer operated by a window through a cord.

1,246,477. **Control System.** F. H. Shepard, assignor to Westinghouse Electric & Mfg. Co. Electro pneumatic system for railway motors.

1,246,480. **Control System.** K. A. Simmon, and A. H. Candee, assignors to Westinghouse Electric & Mfg. Co. Electro pneumatic, for single phase railway.

1,246,481. **Insulator.** K. A. Simmon, assignor to Westinghouse Electric & Mfg. Co. Structure of strain device.

1,246,493. **Pull-Socket.** G. B. Thomas assignor to Bryant Electric Co., Bridgeport, Conn. Structural details.

1,246,497. **Lamp-Shade.** A. J. Tizley, assignor to E. F. Caldwell & Co., New York N. Y. For incandescent lamp.

1,246,500. **Sign Device or Apparatus.** W. H. Tucker, Montclair, N. J., assignor one-half to J. H. Spanjer, Bloomfield, N. J. Structure of interiorily illuminated device.

1,246,508. **X-Ray System.** H. F. Waite, New York, N. Y. Arrangement of tube, heater and connections with high tension and low tension sides of a transformer.

1,246,509. **Protective Device for Light Shades.** F. M. Walker, Detroit, Mich. Structure of screen at lower end of dome enclosing incandescent lamp.

1,246,533. **Electric Lamp-Support.** H. J. Bosworth, Chicago, Ill. Structure of bracket.

1,246,545 and 1,246,547. **Telephone-Exchange System.** H. P. Clausen, assignor to Western Electric Co. First patent: automatic switch operation. Second patent: Arrangement of cord circuits and trunks in a manual system.

1,246,546. **Telephone System.** H. P. Clausen, assignor to Western Electric Co. Arrangement of manual exchange apparatus.

1,246,548. **Testing Arrangement for Telephone Exchange Systems.** H. P. Clausen, assignor to Western Electric Co. For testing the operation of selector switches.

1,246,551. **Automatic Switch for Telegraph-Receiving Systems.** C. B. Cook, Foreman, Ark., assignor of one-half to G. L. Felton, Arkinda, Ark. Details of construction.

1,246,579. **Photoprinting-Machine.** W. H. Fribley, Raymond, Wash. Electric lighting arrangements.

1,246,580. **Timing Device.** W. H. Fribley, Raymond, Wash. Motor driven solenoid-controlled apparatus for giving intermittent movement.

1,246,584. **Vibraphone.** I. J. Galbraith, Pittsburgh, Pa. Attachment for telephone mouthpiece.

1,246,594. **Sound-Amplifier.** K. B. Hastings, Boston, Mass. For application to a telephone transmitter.

1,246,595. **Accumulator-Cell and Method of Making the Same.** H. S. Hawkins, Alturas, Cal., assignor one-half to L. Wilson, Cedarville, Cal. The plates are reinforced by a medium of carbonized sugar, which is filled about them.

1,246,602. **Alternating-Current Dynamo Electric Machine.** L. J. Hunt, assignor to General Electric Co. Arrangement of windings and controlling devices for changing the number of poles.

1,246,617. **System of Distribution and Control.** B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. For operating three-phase railway motors, from a single-phase source.

1,246,619. **Automatic Telephone System.** J. W. Lattig and C. L. Goodrum, assignors to Western Electric Co. Arrangement including private branch exchange trunk lines.

1,246,622. **Electric Table-Stove.** E. N. Lightfoote, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Arrangements wherein a heater is supported at the upper part of a pan.

1,246,623. **Electric Elevator-Control System.** N. G. Lindstrom, and C. F. E. Olofson, assignors to A. B. See, Brooklyn, N. Y. Has special position for dynamic brake control.

1,246,625. **Multicontact Switching Device.** A. E. Lundell, assignor to Western Electric Co. Details of relay-like structure for use in telephone systems.

1,246,626. **Electric Oscillator.** D. G. McCaa, assignor to McCaa Radio Co., Lancaster, Pa. Employs quenched oscillations.

1,246,627. **Trolley.** H. K. McClure, Elk Lick, Pa. Details of wheel structure.

1,246,628. **Remote-Control Electrical Apparatus.** C. P. Wells, assignor to Sundh Electric Co., New York, N. Y. Structure of electromagnetically operated contact device.

1,246,643. **Method of and Apparatus for Transmitting Power.** A. H. Neuland, New York, N. Y. Structure of dynamo electric machine.

1,246,646. **Mechanical Movement.** H. G. Pape, assignor to R. A. Schoenberg, New York, N. Y. For a lever-operated wall switch.

1,246,647. **Lamp-Support.** R. D. Parker, assignor one-half to F. R. Drinkhouse, San Francisco, Cal. Standard for incandescent lamp.

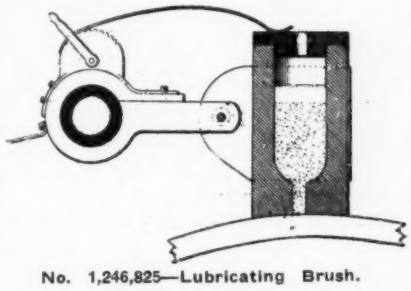
1,246,658. **Process of Welding and Repairing.** J. H. Reid, assignor to Diemund Wenzel Electric Welding Co. Metal deposited by an alternating current arc is spread by magnetic field.

1,246,674. **Starting and Lighting Set for Automobiles.** G. E. Stevens, assignor to General Electric Co. Details of gearing of dynamo electric machine.

1,246,677. **Plug and Receptacle.** H. A. Stoddard, assignor to Chelten Electric Co. Structure of device comprising a one-piece receptacle base block.

1,246,686. **Apparatus for Protecting Electric Circuits.** K. von Kando, assignor to Westinghouse Electric & Mfg. Co. For protecting a circuit from the influence of alternating currents in an adjacent circuit.

1,246,687. **Remote Control for Electric Motors.** C. P. Wells, assignor to Sundh Electric Co., New York, N. Y. Modification of No. 1,246,628.



No. 1,246,825—Lubricating Brush.

1,246,690. **Engine-Starter.** G. M. Willis, assignor to Westinghouse Electric & Mfg. Co. Gearing and connections of a series wound direct current motor.

1,246,691. **Starting Mechanism for Automobiles.** C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. Modification of No. 1,246,205.

1,246,700, 1,246,701 and 1,246,702. **Rotary Converter.** J. B. Bassett, assignor to General Electric Co. Relates to booster system of field control of a rotary converter.

1,246,706. **Signal-Lamp.** G. P. Bourdelat, Aberdeen, N. C. Structure of lens, casing, etc., of a signal lantern.

1,246,711. **Electric Fuse.** L. B. Buchanan, assignor to Chase-Shawmut Co., Newburyport, Mass. Details of construction and mounting.

1,246,712. **Lightning-Arrester.** F. H. Burkhart, Trenton, N. J. Details of contact structure.

1,246,717. **Starting System for Automobiles.** F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Special electromagnetically controlled gearing.

1,246,718. **Starting-Motor for Gas-Engines.** F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Modification of No. 1,246,205.

1,246,719. **Starting System for Automobiles.** A. W. Copley, assignor to Westinghouse Electric & Mfg. Co. Control and gearing of starting motor.

1,246,727. **Carbureter.** G. W. Donning, Stamford, Conn. A motor heating system including a carbureter chamber has the flow of heating fluid electro-thermostatically controlled by the temperature in the chamber.

1,246,728. **Dimmer for Automobile-Lamps.** W. H. J. Downey, Wilmington, Del. For attachment to the front of a headlight.

1,246,735. **Spark-Plug.** H. L. Flood, Ponca City, Okla. Structural details.

1,246,740. **Plate-Press for the Manufacture of Pressed Composite Insulating Sheets or Plates.** E. Haefely, Basel, Switzerland. Structural details of press.

1,246,741. **Switch-Box Stay.** S. L. Hancock, and J. J. Ortner, Oakland, Cal. Details of structure for positioning a switch box.

1,246,744. **Internal-Combustion Engine.** R. W. Ide, assignor to Ide Patents Corp., Springfield, Ill. Throttle valve is electromagnetically controlled.

1,246,761. **Starting System for Automobiles.** J. R. Langley, assignor to Westinghouse Electric & Mfg. Co. Gearing for operating starting motor at different speed ratios as motor and generator.

1,246,792. **Fuse Device.** E. O. Schweitzer and N. J. Conrad, assignors to Schweitzer & Conrad, Chicago, Ill. Fuse is enclosed in a container stopped at one end by a plug which gives when the fuse blows to relieve the pressure.

1,246,809 and 1,246,810. **Flameproof Insulation.** C. Ellis, Montclair, N. J., assignor to New Jersey Testing Laboratories. Insulating material has incorporated with it a chlorinated product of heavy petroleum.

1,246,818. **Electric Contact Device.** A. A. Kent, Rosemont, Pa. Structure of unitary device comprising contacts and a condenser.

1,246,822. **Combined Coil, Timer, and Distributer Device.** E. T. Shaw and G. E. Wood, assignors to Pittsfield Spark Coil Co., Pittsfield, Mass. Details of unitary structure for use in connection with an automobile engine.

1,246,825. **Electric-Machine Brush.** E. F. Ster, assignor to E. O. Schweitzer, Chicago, Ill. A carbon brush having a reservoir for lubricant communicating with the wearing face.

Reissues.

14,394. **Electric Controller.** J. H. Hall, assignor to Electric Controller and Mfg. Co., Cleveland, Ohio. A motor control system wherein electromagnetic switches all have their circuits closed simultaneously but are successively operated.

Patents Expired.

The following United States electrical patents expired on November 27, 1917:

662,386. Electric Traction for Tramway or Similar Vehicles. A. Baisieux, Brussels, Belgium.

662,410. Magnetic Separation. E. Gates, Chevy Chase, Md.

662,411, 662,412, 662,413 and 662,414. Magnetic Separator. E. Gates, Chevy Chase, Md.

662,419, 662,420 and 662,421. Electric Railway. W. Grunow, Jr., Bridgeport, Conn.

662,423. Current Collector. W. Grunow, Jr., Bridgeport, Conn.

662,444. Insulating Composition. C. Jung, Vienna. Austria-Hungary.

662,450. Controller for Electric Motors. J. B. Linn and M. W. Day, Schenectady, N. Y.

662,463. Casing for Electrical Conductor Joints. G. H. Paul, New York, N. Y.

662,465. Commutator. E. D. Priest and G. L. Schermerhorn, Schenectady, N. Y.

662,466. Lightning Arrester for Safety Cut-outs for Electric Circuits. J. Sachs, Hartford, Conn.

662,480. Automatic Circuit Controller. G. H. Whittingham, Baltimore, Md.

662,484. Electric Top for Gyroscopes. E. Ziehl, Berlin, Germany.

662,491. Portable Electrical Device. J. S. Mead, Buffalo, N. Y.

662,501. Safety Cut-out for Electric Circuits. J. Sachs, Hartford, Conn.

662,527. Telegraph Signaling Apparatus. E. B. Ellicott, Chicago, Ill.

662,537. Electric Smelting Furnace. H. Koller, Nuremberg, Germany.

662,543. Telephone Switch. L. M. Neher, North Manchester, Ind.

662,580. Apparatus for Electrically Lighting Railway Carriages, etc. C. Vicarino, Nancy, France.

662,595. Trolley-wire Suspension. J. W. Haynes, Manchester, Conn.

662,630. Brush Holder for Electric Machines. S. H. Short, Cleveland, O.

662,679. Reversible Primary Battery. L. W. Pullen, Camden, N. J.

662,719. Electric Fire Alarm. C. L. Haight, Poughkeepsie, N. Y.

662,727. Attachment for Arc Lamps. E. B. Jones, Chatham, Canada.

662,737. Current Motor. Marcin Puszkar, New York, N. Y.

662,752 Transmission of Electrical Impulses. F. Bedell, Ithaca, N. Y.

662,772. Electric Motor. J. Darling, Chicora, Pa.

662,803. Burglar Alarm. J. L. Murphy, Denver, Colo.

662,833. Railway Signaling. S. D. Strohm, Philadelphia, Pa.

Financial News

GENERAL ELECTRIC NOTES OVERSUBSCRIBED.

While the demand for money is still heavy in the middle West and rates are exceedingly firm at 5½ to 6 per cent, the response to the offering of the General Electric Company's $10,000,000 two-year 6 per cent notes of 98¾, yielding the investor 6⅝ per cent, has been sufficient to satisfy the investment banker that there is investment capital available if the security and the investment return is satisfactory. Investment bankers are convinced that the chief difficulty with the investment market is the feeling of uncertainty regarding ability to retain market values at the present level rather than the lack of funds. At the time the investment bankers at Baltimore were indulging in a gloom fest one of the investment houses with a Chicago office was marketing $3,000,000 of Kansas City Terminal bonds successfully. The General Electric issue of $10,000,000 in notes, which were offered last Friday, has been one and one-half times oversubscribed, according to the bankers. The subscription books were to be closed next day, when it was expected the total subscription would aggregate considerably more than $25,000,000.

INVESTORS FAVORED BY PRESENT CONDITIONS.

Robert J. Graf, secretary of H. M. Byllesby & Co., has recently expressed the following views regarding present investments:

"The investor who has good public utility bonds and preferred stock is today in a position to materially improve his investment position by the purchase of securities which frightened investors are sacrificing without reason. In the readjustment which is naturally going on in this country due to the war, it will be found, when it is finally settled, that the securities of the public utility companies are established on a firmer economic basis than those of any other class.

"It is true with many companies whose sole source of fuel is coal, that a very perceptible increase has occurred in their operating cost, but I feel that this situation is a temporary one, and that it will be remedied either by reduction in the price of coal or an increase of rates by and with the consent of the Governmental authorities. It is entirely unreasonable to suppose that the properly constituted Governmental authorities, either municipal, state or federal, will not recognize the absolute necessity and justice of providing, at least in part, for the increase in the operating costs by allowing an increase in the rates. Where public utility companies are operating by water power, or where their steam power is supplemented by water power, it will be found that they will be able to maintain their operations in a satisfactory condition, with little or no increase in rates.

"The investor in this class of securities should always bear in mind that the property in which he has invested his money is supplying a vital necessity in the every-day life of the community, and at this time, as practically every utility company is furnishing energy to manufacturing plants producing war necessities, will be given favorable consideration by all Governmental agencies, to aid its efficient and normal operation."

A well known investment banker referring particularly to public utility securities, says:

"Don't sacrifice sound securities with the present low prices if you can possibly hold on to them. There is no change in the fundamental situation to justify the sacrifice of dividend paying stocks with adequate assets and high earning power behind them at this juncture. Nothing has occurred, and nothing so far as human foresight goes is likely to occur to in any way impair either underlying assets or earning powers of the important corporations."

Public Utility Dividends.

Central Arkansas Railway & Light Company has declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable December 1 to stock of record November 15.

Electric Investment Corporation has declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable November 22 to stock of record November 12.

Rochester Railway & Light Company has declared its regular quarterly dividend of 1¼ per cent on preferred stock, payable December 1 as registered November 26.

Board of Directors of Kings County Electric Light & Power Company has declared the regular quarterly dividend of $2 a share on the amount of capital stock outstanding, payable December 1 to stock of record November 20.

Nebraska Power Company has declared its regular quarterly dividend of 1¾ per cent on the preferred stock, payable December 1 to stock of record November 15.

Detroit Edison Company stockholders have authorized the issuance of $9,000,000 debenture bonds to provide from time to time for the financial needs of the company.

San Joaquin Light & Power Corporation declared a dividend of $1.50 a share on the preferred stock, payable December 15 to stock of record November 30. The last dividend paid was on April 15, 1914.

Colorado Power Company has declared its regular quarterly dividend of 1¾ per cent on preferred stock, payable December 15 to stock of record November 30.

Baton Rouge Electric Company has declared the regular semi-annual dividends of $3 on the preferred stock and $4 on the common stock, payable December 1 to stock of record November 17.

West Penn Traction & Water Power Company has declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable December 15 to stock of record December 1.

Southwestern Power & Light Company has declared its regular quarterly dividend of 1¾ per. cent on preferred stock, payable December 1 to stock of record November 23.

Interstate Electric Corporation has declared a dividend of 1¾ per cent on preferred stock, payable December 1 to preferred stockholders of record November 27.

Northern Ohio Electric Corporation has declared its regular quarterly dividend of 1½ per cent on preferred stock, payable December 1 to stock of record November 20.

Tampa Electric Company has declared its regular quarterly dividend of 2½ per cent, payable November 15 to stock of record November 9.

Philadelphia Electric Company has declared its regular quarterly dividend of 1¾ per cent, payable December 15 to stock of record November 23.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate. Per cent.		Bid Nov. 20.	Bid Nov. 27.
Public Utilities—				
Adirondack Electric Power of Glens Falls, common		..	17	17
Adirondack Electric Power of Glens Falls, preferred		6	67	70½
American Gas & Electric of New York, common	10	+extra	85	85
American Gas & Electric of New York, preferred		6	40	40
American Light & Traction of New York, common		..	192	222
American Light & Traction of New York, preferred		6	90	92
American Power & Light of New York, common		4	33	37
American Power & Light of New York, preferred		6	67	65
American Public Utilities of Grand Rapids, common		..	24	24
American Public Utilities of Grand Rapids, preferred		6	57	57
American Telephone & Telegraph of New York		..	108	107¾
American Water Works & Elec. of New York, common		..	4	4
American Water Works & Elec. of New York, particip		7	9	8
American Water Works & Elec. of New York, first preferre		..	58	57
Appalachian Power of Bluefield, common		..	1½	1
Appalachian Power of Bluefield, preferred		7	15	15
Cities Service of New York, common		+extra	197	208
Cities Service of New York, preferred		6	72	72½
Commonwealth Edison of Chicago		8	102	107
Comm. Power, Railway & Light of Jackson, common		4	35	35
Comm. Power, Railway & Light of Jackson, preferred		6	61	60
Federal Light & Traction of New York, common		..	50	4
Federal Light & Traction of New York, preferred		..	30	25
Illinois Northern Utilities of Dixon		6	76	77
Middle West Utilities of Chicago, common	2+2	extra	28	25
Middle West Utilities of Chicago, preferred		6	55	58
Northern States Power of Chicago, common		ex div.7	52	54
Northern States Power of Chicago, preferred		ex div.7	85	84
Pacific Gas & Electric of San Francisco, common		5	33	35
Pacific Gas & Electric of San Francisco, preferred		6	89	80
Public Service of Northern Illinois, Chicago, common		7	74½	73
Public Service of Northern Illinois, Chicago, preferred		6	89	..
Republic Railway & Light of Youngstown, common		4	18	23
Republic Railway & Light of Youngstown, preferred		6	55	55
Standard Gas & Electric of Chicago, common		..	3½	4½
Standard Gas & Electric of Chicago, preferred		6	20	18
Tennessee Railway, Light & Power of Chattanooga, common		..	2	2½
Tennessee Railway, Light & Power of Chattanooga, preferred		6	9	9
United Light & Railways of Grand Rapids, common		4	24	28
United Light & Railways of Grand Rapids, preferred		6	59	63
Western Power of San Francisco, common		..	7	7
Western Power of San Francisco, preferred		6	40	40
Western Union Telegraph of New York		extra	83	..
Industrials—				
Electric Storage of Philadelphia, common		4	47½	49½
General Electric of Schenectady		8	129⅞	127½
National Carbon of Cleveland, common		8	56	56⅜
National Carbon of Cleveland, preferred		..	130	130⅜
Westinghouse Electric & Mfg. of Pittsburgh, common	5	+extra	38¾	38⅜
Westinghouse Electric & Mfg. of Pittsburgh, preferred		7	56	57

*Last sale.